120

# MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

October 1994

**FIELD-SAVING MUFFLER**

**NLIMITED AIR RACERS BREAK 200 MPH GALVESTON '94**

**VOID IN-FLIGHT DISASTER!**
**Monitor Servo**
**urrent Drain**


**Vebra**
**20**
**-stroke**

**Bakersfield '94**
**HELI FUN-FLY**

**OWER!**
**stro's New**
**D-cell Motors**

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***ON THE COVER:*** *Bill Cunningham's no. 888 (center) took the Gold at Galveston '94. Inset: Rob Pastor starts his engine for the Gold Trophy Race as "Sporty Scale" columnist Frank Tiano assists. (Photos by Rob Wood.)*

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# EDITORIAL

TOM ATWOOD

## AMA MUSEUM GRAND OPENING

The Frank V. Ehling National Model Aviation Museum officially opened at the AMA's national flying site in Muncie, IN, on Friday, June 10 of this year. If you visit the national flying site, see the museum while you are there; it's well worth it. The use of light and space really brings out the beauty of the many hundreds of exhibits. A series of diorama-style exhibit cases built into interior museum walls offers snapshots in time of modeling history. All of the models have been exquisitely restored. Large, free-standing, glass-enclosed cases highlight the evolution of R/C radios, model engines, R/C aircraft and other modeling gadgetry born of the genius of generations of modelers.

*The newly opened Frank V. Ehling National Model Aviation Museum at the national flying site in Muncie, IN, is a well-designed, bright, spacious facility. Shown here is the interior of a replica 1950s-style hobby shop—complete with kits and products of the era—that sits within the museum.*

Mike Fulmer, museum curator, and colleague Ira Keeler (both have years of hands-on experience creating models and special effects at Lucas Film's Industrial Light and Magic special-effects studio) spent months putting the facility together—and deserve the thanks of all modelers for their efforts. The approximately 6,500-square-foot facility (in a 20,000-square-foot complex) is a cornerstone in the long-term plan to further develop the National Model Aviation Museum. If you have models or modeling memorabilia (particularly from the '30s, '40s and '50s) and would like to help support the future growth of this institution, contact the museum curator at 5151 East Memorial Dr., Muncie, IN 47302; (317) 289-4236.

*The Model Aviation Museum includes a research archive that is a gold mine of modeling magazines, journals and books, many dating back several decades. Bob Underwood, AMA technical director (second from left), and John Worth, model-aviation authority and former AMA executive director (right) mingle with AMA members on the evening of the official opening.*

The AMA's Homecoming '94 festival—an annual AMA fly-in and barbecue—was held at the Muncie national flying site on the weekend of the museum opening. This was my first visit to the national flying site, and now that I've seen the facility, I'm convinced that it can be a major focal point that will help to support and promote R/C modeling in this country.

The expansive, paved flying field is large enough for various forms of R/C competition. Bob Underwood, AMA technical director, noted that demand for this field is quickly growing and that a number of aeromodeling groups had already signed up to use the field in the summer of '94. Plans include more paved runways as well as camping areas. If you have a chance to visit the facility to attend an event or just to fly there, I think you'll like what you find.

### NEW EXECUTIVE EDITOR

I am pleased to welcome aboard Frank Masi, formerly Executive Editor of *R/C Car Action*, a sister Air Age publication, as executive editor of *Model Airplane News*. As the newest member of our growing editorial team, Frank brings strong technical editing skills, a proven publishing background and considerable R/C experience to the table—strengths that will help us bring you an even better magazine each month.

*Howard Crispin (left), AMA District IV vice president and chairman of the AMA sound committee, Group Editor-in-Chief Tom Atwood (right), and AMA president Don Lowe (middle), discuss modeling issues (from the growth of the hobby to variable-pitch props) while enjoying the action in the pit area at the Muncie, IN, AMA flying site. The museum opening coincided with a two-day AMA Homecoming '94 fly-in.*

### TALK TO THE EDITORS

Speaking of our editorial team, we are, to a person, vitally interested in giving you exactly the kind of editorial coverage you want. Why not let us know about the kinds of articles you'd like to see or what you have liked in previous issues? You can communicate your thoughts to us directly via fax at (203) 762-9803 or over the Internet at these addresses: Tom Atwood—toma@airage.com; Frank Masi—frankm@airage.com; Julie Soriano—julies@airage.com; Chris Chianelli—chrisc@airage.com; and Gerry Yarrish—gerryy@airage.com. We look forward to hearing from you. ■

*An immense variety of restored vintage models is on display at the museum. Planned expansion of the approximately 6,500-square-foot facility in future years may double or triple the size of this national repository of our modeling heritage.*

MODEL AIRPLANE NEWS

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# AIRWAVES

**WRITE TO US!** We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

## ERRATA

In the August '94 issue, we published the incorrect telephone number of Petal Mfg., as mentioned in Frank Tiano's "Sporty Scale." The number should have been (908) 766-7095. We apologize for any inconvenience.

**Hints and Kinks**—We apologize to Jim Newman and the two contributors concerned for the errors made in these two tips, which were in the August issue. Here are the tips, *exactly* as submitted to us; for the illustrations, refer to the August issue.

• **Music-Wire Reamers.** Sharpen a few differing sizes of music wire, as shown, making sure they really are flat by careful stoning. With handles bent in the end, they are very useful for reaming out soft metal or plastic wheel bearings, for example. *—Eric Marsden, Horndean, Hampshire, U.K.*

• **Clay Clearance Gauge.** To determine the clearance between components such as servos, as shown here, put a little pillar of modeling clay on top of the lower servo then attach the wing. The clay will compress and, after removing the wing, will reveal the degree of clearance. If servos are held with double-stick tape, they can be repositioned without the penalty of redundant screw holes. Screws should be used for final retaining, of course!

*—Emile Alline, Lynwood, WA*

## GHOST OF GOERING

I enjoyed your June issue, particularly the beautiful Dornier D.I on the cover. The events surrounding the Dornier D.I are similar to the plot of the movie, "The Blue Max," starring George Peppard. In fact, on June 12, 1918, Wilhelm Reinhard was credited with his 20th victory. This made him eligible for the Pour le Merite, but the claim was contested by Willi Gabriel (whose D-VII color scheme is a favorite of scale modelers). Gabriel was persuaded to relinquish his protest so that Reinhard could get the medal. This was unfortunate for Reinhard, as we shall see.

Reinhard was invited to the fighter competition at Adlershof as an ace and impending recipient of the Blue Max. At Adlershof, he flew the Dornier Zeppelin-Lindau D.I. Its initial flight had been under the control of a pilot who was a 21-victory ace, holder of the Pour le Merite and leader of Jasta 21. Reinhard was killed when the top wing was torn off in a dive. I wonder how history would have been changed—for better or for worse—if the pilot of the initial flight had been killed?

That pilot went on to become Kommandeur of Richthofen's Jasta 1. He then changed the traditional red of the JG 1 aircraft and flew an all-white Fokker D-VII, but he didn't increase his record of aircraft shot down. He was, of course, the infamous Hermann Goering. As soon as I saw the cover photo of your June issue, the face of the pilot struck me: he looks exactly like photos of Goering in WW I with Richthofen and other photos of him in his white D-VII. Did Steven Stratt intend the resemblance, since he did so much research on the aircraft? Did anyone else see the likeness?

GEORGE SCRIMSHAW, M.D.
*[City of origin unavailable]*

*Yes, George, in comparing our June cover with photos of Herman Goering (the last commanding officer of the Richthofen squadron), we do see a ghostly resemblance between him and Steve Stratt's William Bros.' pilot bust. When we called Steve, he told us that he had taken the trouble to duplicate the infamous aeronaut. He went on to say that Goering was very impressed with the Dornier D.I; he thought that it could easily out-turn the Fokker D-VII and had the same climb performance. Pondering how history might have been different if Goering hadn't lived and gone on to command the German Luftwaffe is intriguing. Another question: what would have happened if Reinhard had lived? Would he have been a superior commander? Thanks for your historical comments.* GY

### NASA SOLUTION

I am 16 and have been modeling for four years. I'm addicted to flying my models, but I recently bought a .25-size Citabria that was less than pleasurable to fly. It had such bad stall tendencies that takeoffs were nearly impossible to accomplish. When it *did* make a successful takeoff, it snapped at slow speed and in loops. After the first test flights, I immediately took it back to the workbench and checked the balance and washout again, but in subsequent flights, this provided no help whatsoever.

After many attempts to solve my problems had failed, I was nearly ready to scrap the plane. Then I read Roy Day's "Taming that Stall" in your November '93 issue, and this immediately gave me hope. I added a NASA leading-edge cuff to the outer 25 percent of the 49-inch wing. On the next flight, I was amazed at how quickly it lifted off the ground and at how much better aerobatics were, except for inverted flight.

Thank you for all the great articles. I'm curious though; why did my washout have no effect?

JOHN UPTEGROVE
*Buckner, MO*

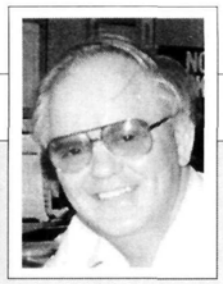
*John, those small models often prove to be a tremendous handful, even for someone as experienced as you. For some reason, these small designs often end up in the hands of beginners, and that's unfortunate. Spread the word: beginners should start with larger trainers because of their predictable stability. They simply react more slowly and smoothly while lacking the unpredictable "squirreliness" of small models. A trainer such as the new 74.5-inch-wingspan Midwest Aero-Star 60 should prove to be fantastic.*

*Though you didn't tell us the wing loading, apparently, your little model was well into the "danger zone" in terms of loading, and the washout simply wasn't enough of a solution. The NASA leading-edge cuff that fixed your problem, however, is a far more radical approach.*

CC

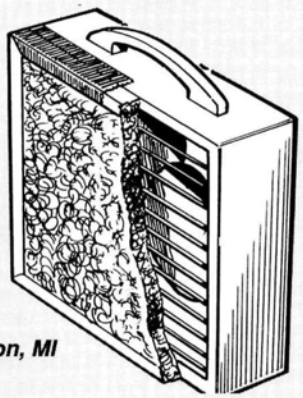
*(Continued on page 109)*

# HINTS & KINKS



JIM NEWMAN

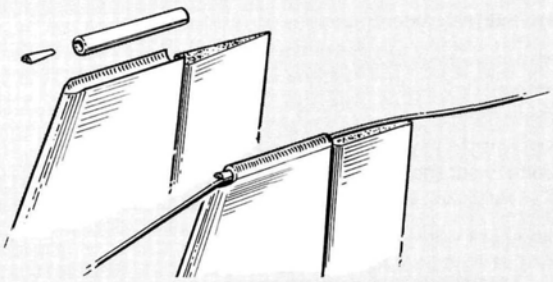
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive,we can't acknowledge each one, nor can we return unused material.



## DUST COLLECTOR

A 20-inch (51cm) diameter window fan with a furnace filter taped over the front collects sawdust very nicely. Do your sanding and sawing in front of it. Watch garage sales for an inexpensive unit.

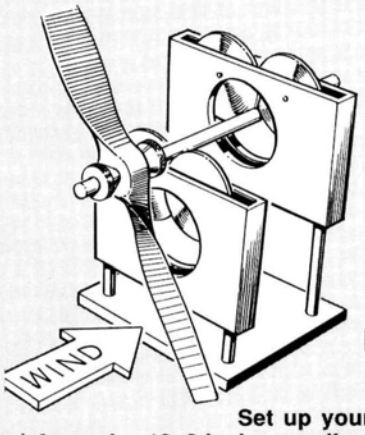
*Dale Vander Ploeg, Jenison, MI*



## STREAMLINED ANTENNA MOUNT

A piece of outer Nyrod glued to the top of the fin eliminates knots or rubber bands. Run the antenna through the tube, and secure it with a wedge from a split toothpick. The wire will still pull out in a crash. This neat method will work on round-top fins, too.

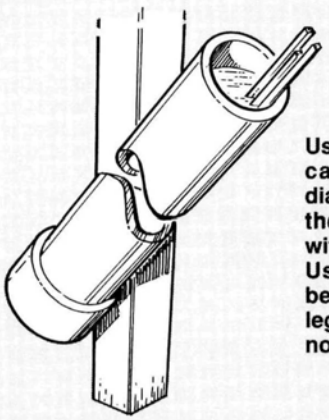
*Kris Doub, Silver Lake, IN*




## BALANCER WIND GAUGE

Set up your balancer with the flat (rear) face of a 10x6-inch propeller facing into the wind. Measure the rpm with a digital tachometer, then calculate wind speed by dividing the rpm by 176 (for mph), or by 200 (for knots). Example: 880rpm/176=5mph (4.4 knots).

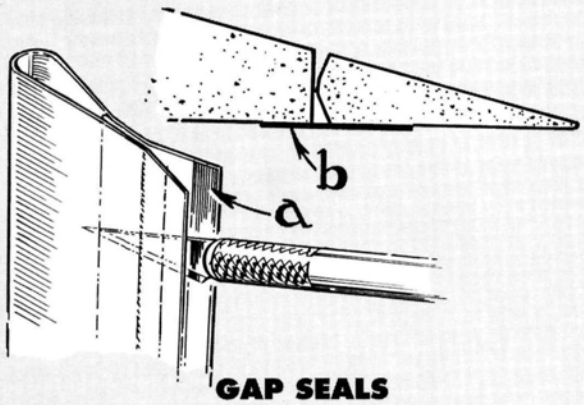
*John Cabigas, Yuba City, CA*



## AMMONIA BATH

Use PVC pipe cement to glue a cap onto a piece of 4-inch-diameter PVC pipe that's cut to the desired length, then fill it with 50/50 ammonia and water. Use it to soak stripwood for bending. Tape it to the bench leg for safety, and cap it when not in use or while soaking.

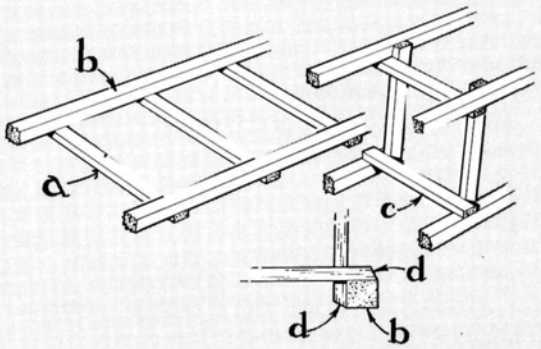
*Phil Oden, Muskegan, MI*




## GAP SEALS

Split the strips of self-adhesive index tabbing (from the stationery store), peel the paper strip (a), then stick it under the wing (or on top of the elevator) (b). Gap seals should be positioned where pressure is positive, which helps keep seals closed against leakage.

*Robert Castle, Houston, TX*




## SIMPLE LAP JOINTS

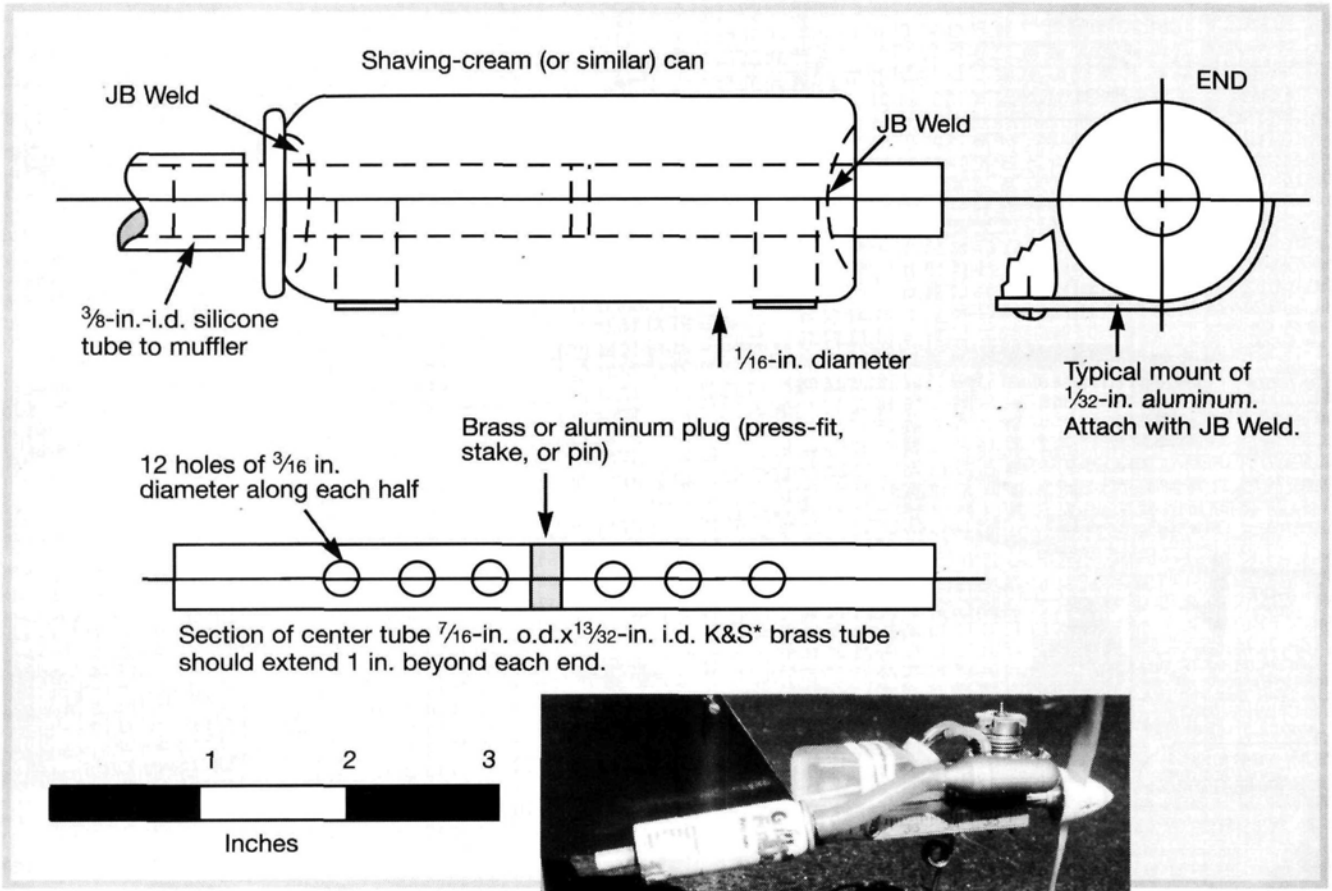
Your columnist can vouch for this, having used it for several years. Pin down over-length uprights (a) first, then glue longerons (b) on top. Stand the sides up for joining, then lay over-length spacers (c) on top of the longerons. For the next side, pin longerons on top of the first set, then add uprights on top of those. Give a few strokes of a sanding stick to angle the ends of spacers (d) so that they don't show through the covering. Lapped joints are fast and make a strong and very stiff structure.

*George Thompson, Napanee, Ontario, Canada*

HOW TO

# Make an Engine-Quieting After-Muffler

by George Wilson






PHOTOS BY GEORGE WILSON

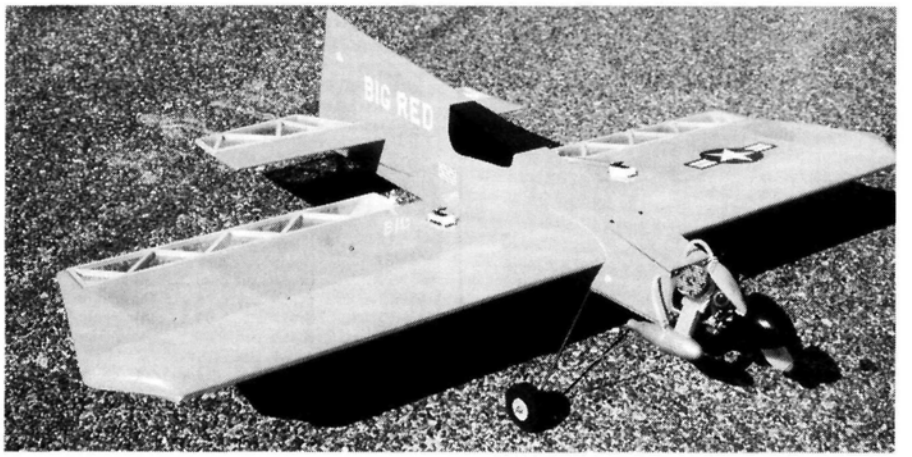
***Here, the after-muffler is installed behind the Enya .15 stock muffler in the author's Litestik Junior. In the air, the Litestik Junior can easily be mistaken for an electric powered model.***

THIS LIGHTWEIGHT, model-quieting after-muffler can be fabricated using simple construction techniques (see "How to Make a Mousse-Can Muffler," *Model Airplane News,* March '94 and "Airwaves," June '94; and "The Mousseler" in *Model Aviation,* August '93). The design adds minimal weight, impacts rpm only marginally, costs little, places the exhaust outlet farther aft so that less of your plane will need a wipe-down after flying and, perhaps most important, reduces noise very effectively (which can help save flying fields; see "Sound Benefits" below). It has been a very effective sound-suppresser on my Enya* .15 and Fox* .40 Standard engines and seems to have little effect on their power.

**SOUND MEASUREMENTS**

| Engine | Muffler | Propeller | Rpm | dB |
|---|---|---|---|---|
| Enya .15 | Stock | Tornado 8x6 | 11,000 | 87 |
| Enya .15 | Stock/after | Tornado 8x6 | 10,500 | 83 |
| Fox .40 Standard | Stock | Top Flite* 10x6 | 10,000 | 94 |
| Fox .40 Standard | Stock/after | Top Flite 10x6 | 9,500 | 90 |

Measurements were made 9 feet from the engines, which were mounted in aircraft.
Sound was measured with a Radio Shack sound-level meter set on the "A" response curve.



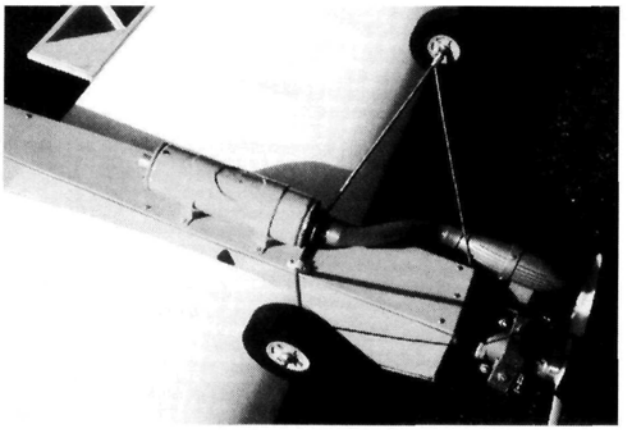
***George Wilson's "Big Red" NOTFORSALE (see the construction article in Model Airplane News, May '93 by Blaine Stetler) performs as claimed by the designer/author. It's powered by a Fox .40 Standard engine with an after-muffler added. Even with the after-muffler, the plane goes straight up, rolling, with a weight of 4½ pounds.***

## AFTER-MUFFLER FABRICATION

The after-muffler is easy to construct, and its dimensions appear to be non-critical. Nearly any size spray can that looks appropriate should work well. *[Editor's note: use only cans that have contained non-toxic, nonflammable substances, e.g., shaving-cream or hair mousse. Always completely deplete the can of pressure before opening it.]*

To make the after-muffler, refer to the drawing. First, vent the can to zero (atmospheric) pressure. Using a drill and/or a round file, open a 7/16-inch hole in each end of the can, and remove any internal parts. Prepare the center tube, and insert the center plug. I held one plug in place by "staking" it in several places with a center punch. The other was press-fitted. They could also have been pinned or held with 2-56 screws.

The positions of the 3/16-inch holes aren't critical. Carefully clean the center pipe and the ends of the can before assembling them with JB Weld* high-temperature epoxy. Install the mounting straps, drill the oil-drain hole, and you'll be ready to install the after-muffler. Use a short piece of 3/8-inch silicone tubing to connect it to the muffler, and attach the mounting straps to the fuselage with wood screws.



***With the after-muffler installed, the Fox .40 runs at 90dB (a 4dB improvement over the stock muffler). With a little planning, these after-mufflers could be mounted internally. They run warm, but not hot.***

## SOUND BENEFITS

These after-mufflers reduce noise very effectively. This is apparent subjectively and in sound-meter readings (see chart). The 4dB decrease represents a factor of well over two-to-one in reduced sound power. The loss in rpm is less than 500, and no attempt was made to adjust the carburetor carefully when the mufflers were attached. In any case, with the muffler installed, my 4½-pound NOTFORSALE still goes straight up, rolling as it goes.

These mufflers don't get hot. This suggests that they could be mounted internally to reduce drag and improve the appearance of your model.

Given the expense of good primary mufflers and the apparent reluctance of engine manufacturers to improve stock mufflers, after-mufflers really are attractive alternatives.

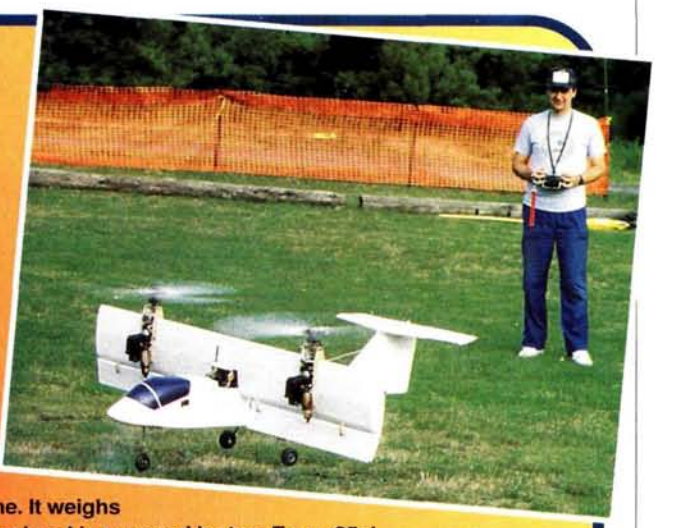
**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

# AIR SCOOP

CHRIS CHIANELLI

*New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!*

## R/C TILT-WING VTOL



Mark Scott of Hamden, CT—an aeronautical engineer and member of the East Coast Swamp Fliers R/C club—sent us these photos of his vertical takeoff and landing (VTOL) design after seeing our August '94 cover story on the Vertigo VTOL sport model designed by Tom Hunt. Mark's model is a tilt-wing; the entire wing rotates with the nacelles and "prop rotors" (rotors doubling as propellers). The plane has a wingspan of 63.5 inches, 27-inch-diameter prop rotors and a 4-to-1 reduction transmission on each engine. It weighs 12.1 pounds with fuel and is powered by two Enya .35ci helicopter engines.

Compared with a tilt-rotor, a tilt-wing has more wingspan and area as well as smaller prop rotors, and that makes it a better high-speed aircraft and more maneuverable. Mark reports that hover tests are going well; he has no trouble steadily hovering over a circle of about 4 feet in diameter. It doesn't yet perform as well as the R/C heli he flies, but it's still impressive. As we go to press, Mark is still tweaking the system to get the right response and damping from the gyros. Transitions between horizontal and vertical flight have yet to be performed.

Mark purchased Kyosho electric heli swashplates and built the hubs himself. In hover, he uses cyclic rotor-pitch control for aircraft pitch control; differential collective for roll control; and differential flaperon for yaw control. Mark is designing an electronic control mixer that will automatically change radio-control inputs to traditional airplane flight controls for horizontal flight. Assuming Mark perfects this amazing machine (he's obviously well on his way), he may provide *Model Airplane News* with an article that will permit others to follow in his footsteps. We, of course, will keep you fully apprised.


## MIDWEST'S Extra 300S

After their fantastic success with the AT-6, everyone has been looking forward to Midwest's next giant-scale offering, and here it is. Designed by world-class pilot and TOC competitor Mike McConville (shown), the new Pro Series™ 300S has an 80-inch wingspan (1,162 square inches of area), making it IMAA legal. As with all Midwest kits, the 300S kit is loaded with micro-cut balsa, lite-ply and hardware, and it features light, rugged jig-lock construction. Power requirements are: a 1.2 to 2.2ci 2-stroke or a 1.5 to 3.0ci 4-stroke. Stay tuned for further 300S updates.

# ULTRA VIPER


Three guesses who offers this wild machine; and the first two don't count. Bob Violett—who else? In Waco, TX, on June 25, the Ultra Viper racer jet passed through the J.P.O. Speedmaster traps at an astounding 235.5mph. Although this amazing speed is available, the new airfoil and flaperon arrangement give excellent low speed and landing performance. Although, like other Violett kits, it's highly prefabricated of epoxy/glass, Kevlar and carbon-fiber composite structures, the Ultra Viper is definitely designed for the advanced jet modeler.

If you'd like to act out some beach-head battle scenes at your local slope site, this new Model Tech P-51 slope soarer will interest you. Model Tech is known for their high-quality products, and their P-51 is fast because it's narrower in terms of frontal area, but it retains that beautiful Mustang profile. Specs: wingspan—50 inches; weight—30 to 35 ounces; area—428 inches. The kit features shaped, sanded components and an extensive hardware package. A .25- to .36-powered version will be introduced this fall. Contact Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92728; (714) 963-0133, or (800) 346-6543.

## MODEL TECH Mustang

# A Rich Texan

Dress up your Midwest Texan with Rich Uravitch's vacuum-formed plastic parts set and Rich Uravitch Signature Series markings from Dry-Set. The parts package consists of two instrument panels with gauge faces, an instrument-panel hood, two cooler scoops, leading-edge joint fairings, a tail-wheel strut fairing, a set of clear landing and tip lights and a dummy radial engine, and it costs $24.95 (the dummy engine is available separately for $8.95). Order direct from Rich Uravitch, 15 Newcomb Trail, Ridge, NY 11961.


Also shown is a composite of the new Dry-Set marking sheets specifically developed for Midwest's SNJ. Five sets of markings are available: the Rich Uravitch Signature Series for his no. 21 Texan and four other similarly marked GTMO (Guantanamo) Bay Texans. Markings for Eddy VonFossen's Reno racer—Miss TNT—are also available. All sheets include difficult-to-duplicate stencil and placard markings. Contact Dry-Set Model Markings Inc., 7029 Sanger Ave., Waco, TX 76710; (800) 437-9738, or (817) 741-0379.

# FLAP SAVERS

These new Kavan Burkart Flap Savers will protect your flaps and flap servo during those hard landings. These stainless-steel, adjustable-tension, spring-loaded control arms allow the flaps to retract upward if they hit the ground. Each is about 5 inches long, but can be shortened to 3 inches. They're just a few of the new items in Hobby Lobby's new no. 24 catalogue, which is free in the USA; simply call or write to them. Hobby Lobby Intl., Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444, 24 hours a day, 7 days a week.

# PILOT PROJECTS

## A LOOK AT WHAT OUR READERS ARE DOING

### SEND IN YOUR SNAPSHOTS

*Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.*

*All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1994. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!*

*Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.*

### AUSTRALIAN BRONCO

Hans Heck of Stirling, Australia, spent four years scratch-building this beautiful OV-10A Bronco counterinsurgency aircraft. Hans also designed and built the Bronco's scale retracts using mostly carbon-epoxy composites. The 72-inch-span plane weighs in at 15.4 pounds, and power is supplied by two O.S. .40 FSR engines. It was first flown in '86, and it has won eight first places in scale competition. Hans says that he's presently designing a mammoth-scale version of the Bronco; we can't wait to see that one!


### LION OF THE SKY

Joe Casey of Naples, FL, built this ¼-scale replica of the Wendell Williams Gilmore Red Lion. (Roscoe Turner raced the full-scale airplane in the '30s.) Joe spent four months scratch-building this beautiful replica from Wendell Hostetler plans. The 84-inch-span plane tips the scales at 24 pounds, and it's powered by a Zenoah G-62 engine with a 22x10 prop. The model is flown often, and it competed at the Galveston races in May. Great job, Joe!

### JOHNSON'S AEROBATIC EYE

Ricky Johnson of Indianola, MS, has been into R/C since June '93; he says that he enjoys reading *Model Airplane News* and really likes "Pilot Projects." Evidently, Ricky likes tractors as well as R/C planes; after seeing several fellow modelers paint their planes "John Deere" green, he decided to paint his Goldberg Eagle II in Case/International Harvester colors (red, black, white and silver). He likes to use his Eagle II to keep an eye on what other modelers are up to; it's equipped with an onboard 35mm camera. If you fly in Indianola, you never know who's watching!

### LEE'S FLORIDA AEROMASTER

This red and white Super Aeromaster is shown in its element at a local airstrip. Robert S. Lee of Sebring, FL, built the model from a Great Planes kit. This bipe is powered by a .60 Enya XF 2-stroke engine with a 12x8 prop. The Aeromaster, which took more than two months to complete, features servos for each aileron, an enlarged pull/pull rudder and Jule Tonga wooden spars and N-struts. Robert finished his project with Super Coverite and Red Devil paint. He also custom-built the aluminum landing gear. It's surely a source of pride.

# PILOT PROJECTS

## 1/4-SCALE WITMAN BONZO

This ¼-scale, scratch-built model of Steve Witman's golden-age racer, "Bonzo," comes from Johan Larsson of Uppsala, Sweden. Built of balsa and ply from a three-view plan, the 65-inch-long model has a 51-inch wingspan and weighs a svelte 13 pounds. Power comes from a Saito 150S 4-stroke engine with a Graupner 16x8 prop. Johan spent more than four months constructing his project, and he controls the Bonzo using a Sanwa (Airtronics) Infinity radio. He has been flying R/C aircraft for six years and belongs to the "RFK FYRIS" club in Uppsala.

## F-86 IN NATO COLORS

After seeing photos of Joe Lupton's F-86 Sabre in an issue of *Model Airplane News*, Francisco Buelna of Adelanto, CA, decided to send us some photos of his Jet Hangar Hobbies F-86. Decked out in the NATO-style camouflage that was used on some USAF F-86s and F-84s during the mid-'50s (Formula-U paint was used), this model gets its thrust from a K&B 7.5cc ducted-fan engine with a Turbax I fan unit. Nine servos are used to control the surfaces, and Rhom-Air retracts make touchdowns a breeze. Francisco controls his jet with a Futaba Super 7 transmitter.

## ANDERSON'S AMERICAN ACE

Seventy-year-old Norman Anderson of Newport, RI, is, in his own words, "enjoying his second childhood" with this old-timer monoplane. Back in 1941, he built a free-flight American Ace mono that was patterned after the carrier-based planes of the '30s. Because the Ace was his favorite model, he decided to construct another mono—this time, from a Midway Model kit. Norman's New Ruler is powered by a Saito .65 Golden Knight engine. Fabric covering from 21st Century gives the plane its sharp red-and-white scheme, and a Fiberglass Specialties cowl spruces up the mono's nose. Of course, Captain Eddy (as in Rickenbacker) has things well in hand.

## BIG BROWN B-2!

You're looking at the latest project of Donald Kunath, of Elroy, WI. This huge, ½-scale replica of the Brown racer B-2 "Miss Los Angeles" is scratch-built of spruce, ply and aircraft tubing. Covered in Coverall and finished with automotive paint, this behemoth boasts a 120-inch wingspan and a length of 127 inches. The task of moving this 53-pound plane falls to a T&S Engines 104cc twin in-line engine spinning a 24x16 prop. Donald spent 1,872 hours completing the project, and he reports that the Brown is a great flier. You've wowed us, Donald!

CONSTRUCTION

# FUTURE SHOCK

by BILL EVANS

*The Future Shock is the latest version in the Scimitar Series. It can be built for electric or glow power.*

**MANY OF the aircraft in the Scimitar Series have been electrified (power ranges from Cobalt 05s to 60s), and many of you have built the slow-motion electric version—the Charger; nevertheless, the Future Shock is the first Scimitar designed specifically for both electric and glow power.**

**Soon after Tom Atwood became editor of *Model Airplane News*, we chatted about his plans for the magazine. Ideas were tossed back and forth, and we were both soon hooked on the idea of a Scimitar specifically designed for a hot, strong-running motor, and that was the origin of the Future Shock!**

## SHOCKING POWER

**Tom and I discussed two concepts, and then ideas quickly began to flow. Astro Flight's* Bob Boucher sent us a Cobalt 25 super-wind FAI motor. Trinity* contributed 16 of their 1400mA pushed cells. Bob welded the cells together, installed his new gold connectors and topped everything off with his new speed controller. Larry Sribnic of SR Batteries* rushed a pack of his 1100mA cells—16 of them—to me. (My Futaba* 7UAF radio has never had even a glitch with one of these.)**

*This version has a side-mounted K&B .65 engine and a Mac's* flow-through pipe.*

## SPECIFICATIONS

**Type:** Scimitar Series

**Wingspan:** 56 in.

**Wing area:** 800 sq. in.

**Airfoil:** ESA (Evans Scimitar Airfoil, semisymmetrical reflexed)

**Length:** 40 in.

**Power:** Astro Flight Cobalt 25 racing motor, 16 1400mA batteries; or .40 to .60 glow engine

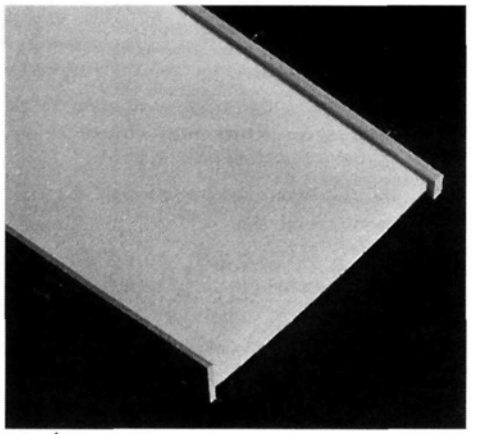
**No. of channels req'd:** 4 (throttle, nose wheel, elevons—2 servos)

**Fuselage construction:** balsa and ply

**Wing construction:** balsa and foam

**Weight:** 6½ lb. (electric), 5 lb. (glow)

**Wing loading:** 19 oz./sq. ft. (electric), 14½ oz./sq. ft. (glow)



*The ⅛-inch-thick, balsa, leading-edge undercap and the ¼-inch-thick balsa trailing-edge spar have been glued and pinned to the foam-core.*

Then it was time for me to do my part. The new ship had to look different, and I decided on a 60-size Scimitar wing, but I reversed the wing taper; instead of the typical swept-forward trailing edge, the Future Shock has a straight one. I also decided to reverse the taper on the elevons and make the tips wider than the root. The sleek fuselage has a forward-mounted canopy; and mounted on the wing, just outboard of the fuselage, there are two fins canted outward—again, something different. With the drawing complete, it was time to stir up some balsa dust!

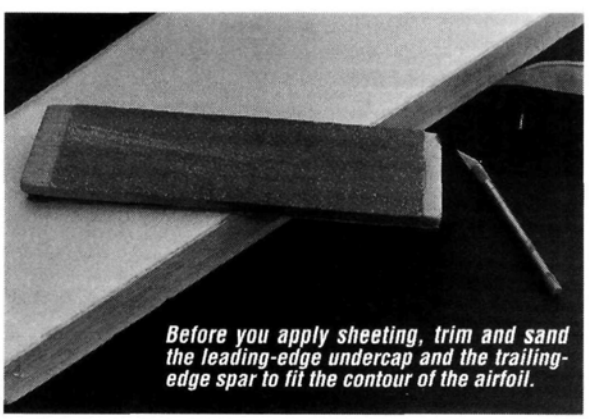
As is typical of Scimitar construction, the box fuselage has tri-stock in the corners for rounding (been doing this for years). The foam wings are partially sheeted with 1/16-inch balsa bonded with Soaring Research* Corefilm. The basic construction took about six hours, and I took longer than that (always do!) to cover the plane; installing the motor and radio took a further six hours.

### CONSTRUCTION

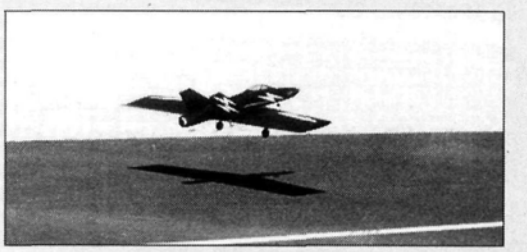
If you follow the plans carefully, building the Future Shock will be as rewarding as flying it.

The Future Shock's construction is typical of the Scimitar Series. The fuselage has two sides, top and bottom pieces, a firewall, one former and ½-inch triangular longerons. For its lightness and strength, I chose foam for the wing, which is sheeted with 1/16-inch balsa. If you aren't adept at cutting your own foam-cores, you may order Future Shock cores from Soaring Research* ($20 each set, plus $7 per set for shipping).

Start by cementing the ⅛x1-inch balsa leading-edge undercap to the leading edge of the wing panels, and cement the ¼x½-inch balsa trailing edge to the trailing edge of the wing panels. Set them aside to dry.



*Before you apply sheeting, trim and sand the leading-edge undercap and the trailing-edge spar to fit the contour of the airfoil.*



## FLIGHT PERFORMANCE

I've often been asked, "Why do you fly Scimitar Series aircraft? Because you *designed* them?" My answer is one word—*performance!*

As we all know, there's a point at which lift is terminated by a reduction in forward motion and an increase in the wing's angle of attack. When this happens to a conventional airframe (one with the horizontal stabilizer mounted aft of the wing), the model falls, the wing may rotate axially (left to right), and a vertical descent results. Only if it has enough altitude to regain sufficient forward motion can the aircraft be saved.

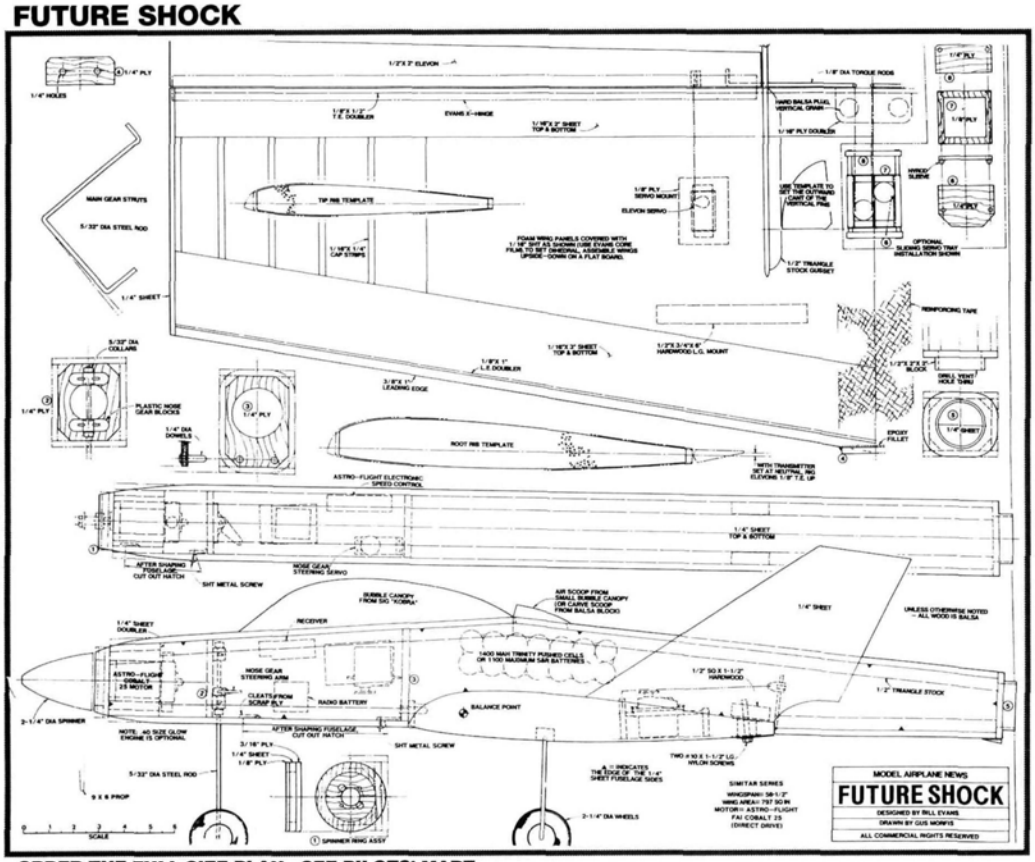
None of this applies to any aircraft in the Scimitar Series; stall does *not* occur. Instead of stalling, any Scimitar design will automatically drop its nose slightly and continue in normal forward flight! That's one flight advantage of the Future Shock—no stall.

A second advantage of the Scimitars is their wide speed range. No matter how much power you give them, they just go faster—no Dutch roll.

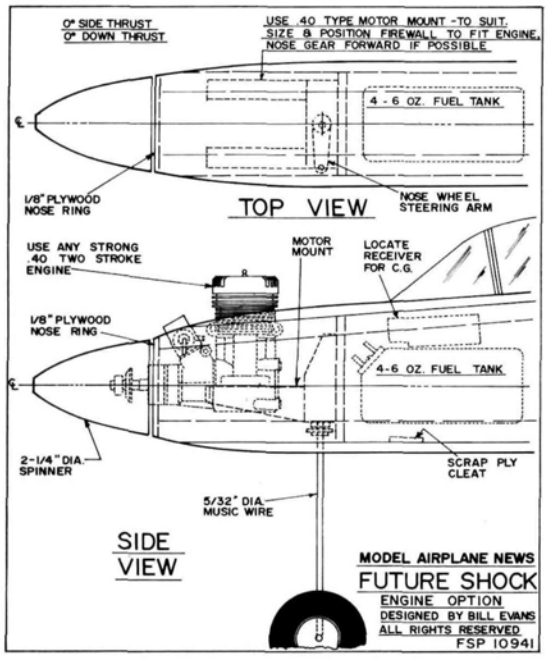
Third, they will also slow to a crawl (because they don't stall) and set down like a hang glider.

Finally, the Future Shock will remain in the attitude you direct it to. Blip a little left aileron and it will hold in a left turn—hands off—and, without strong wind, it will continue to do 360s until you decide it's time to quit.

Scimitar pilots have enjoyed these superior flying capabilities for more than 20 years.




**ORDER THE FULL-SIZE PLAN...SEE PILOTS' MART**




Next, cut the fuselage parts out of balsa and plywood stock. Clamp the former and the wing's center plate together, and drill holes through them for the ¼-inch-diameter dowels that go through both. (Drilling them in this way will ensure that they'll be properly aligned.) Now pin the ¼-inch front and rear bottom fuselage pieces down onto your work surface; they should be on a straight line and separated by the width of the wing cutout on the fuselage sides. Pin the ½-inch tri-stock down on one side of each bottom piece, ¼ inch away from the edge.

Pin one fuselage side into place, and then the firewall and the former. Now apply thin Hot Stuff* to the edges of the ½-inch tri-stock where it meets the fuselage side; the glue will run into the joint and bond the pieces together. Also apply Hot Stuff to the firewall and the former. Repeat these steps for the second fuselage side. Pin and cement ½-inch tri-stock to the inside of the fuselage top, and fill the engine compartment (to the nose ring) using ¼-inch balsa sheet. Sand the top smooth, and install the top sheeting. When the glue has dried, remove the fuselage from the work surface and run CA into any joints on the inside of it that you might have missed. To finish the fuselage, carve and sand it to shape.

Carve and sand the wing's leading- and trailing-edge balsa so that the sheeting will fit nicely over it. Apply the sheeting (I used Corefilm), then pin and cement the ⅜x1-inch leading-edge cap to the leading edge. Sand the wing panels to shape, then apply the tip plates and join the wing halves with 5-minute epoxy. To join the elevons to the wing, I used an X-Hinge (available from Soaring Research), but no matter which hinge system you use, seal the gap to improve the efficiency of the airframe.

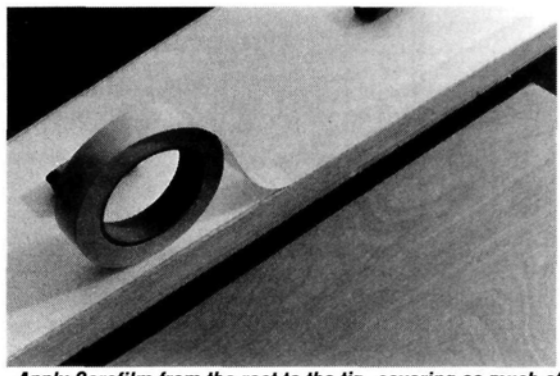
When building a Scimitar-type aircraft, there are three "musts":

- Set the CG as shown on plans.
- With the elevator trim set at neutral, set the elevons to have ⅛ inch of up-trim.
- Set the nose wheel so that the wing's leading edge is ¼ inch higher (in relation to the ground) than its trailing edge, measured at the hinge line.

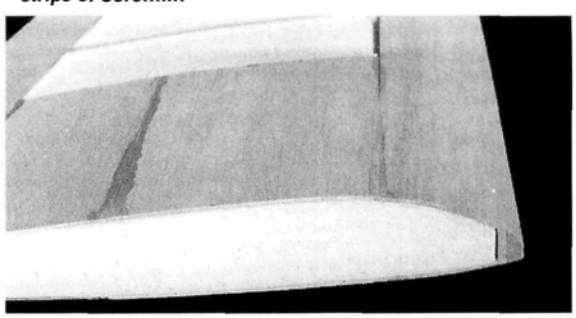
## MOMENT OF TRUTH

The moment of truth was drawing near. I charged the Trinity 1400mA pack with the Astro DC/DC charger at 5 amps for 20 minutes. Power? You bet! Two pounds of batteries put out a lot of power. The tip speed of the 9x6 prop is more than 400mph; that's more than 16,000rpm!

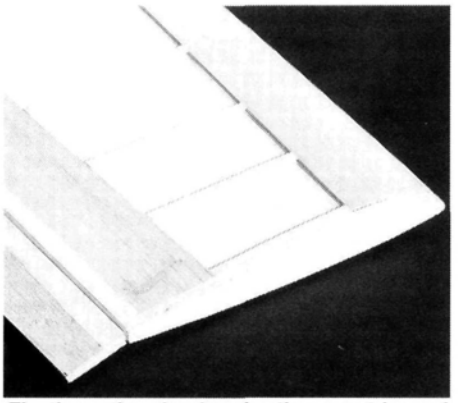
I videotaped the checkout flight. The Future Shock went straight down the runway and lifted off easily; climb-out was straight up to more than 200 feet, and speed almost equaled what I'd obtain with a .40 glow engine. Loops followed by five or six fast rolls and inverted low passes at full power are a sight to behold. When, after 2½



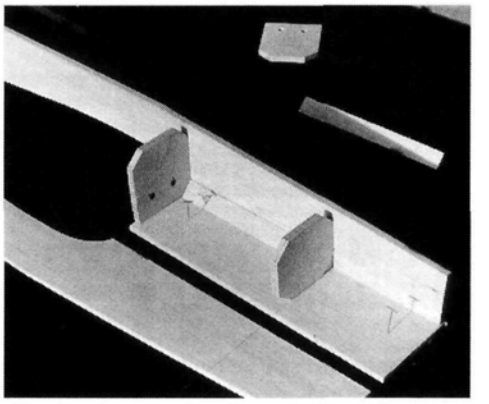
***Apply Corefilm from the root to the tip, covering as much of the core as possible. Leave 1/16-inch gaps between the strips of Corefilm.***



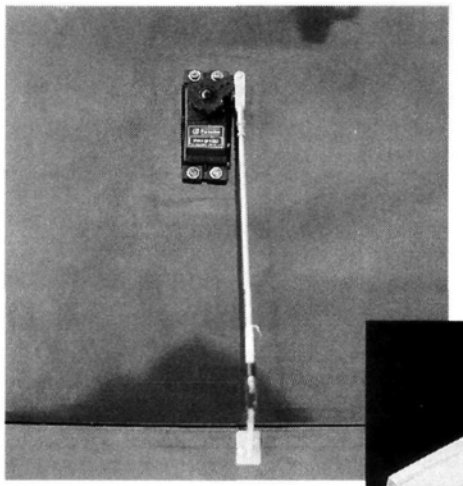
***The root section showing the sheeted wing with a view of the 1/8-inch-thick undercap and the leading edge shaped to the airfoil.***



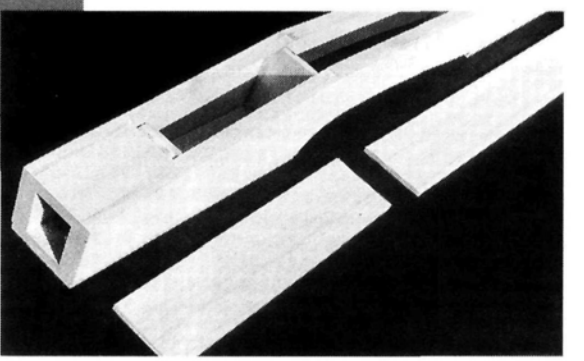
*The tip section showing sheeting, capstrips and elevons attached with an X-Hinge.*



*The fuselage front and rear bottom pieces are pinned to the work surface, ½-inch triangular stringers, the wing former, the firewall and the left fuselage side have been pinned and CA'd into place. Note: for the electric version, the motor mount is part of the spinner-ring assembly (see plans).*



*When using electronic mixing, the elevon servos are mounted outboard on the underside of wing.*



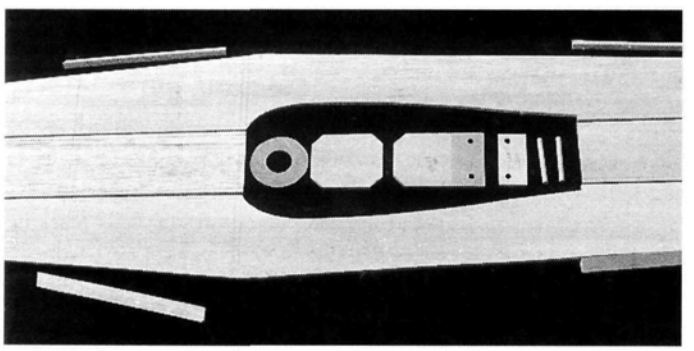
*The right fuselage side and the top ¼-inch triangular longerons are in place, and the ¼-inch balsa-sheet nose fill has been installed. Before the fuselage top pieces are attached, the fuselage top must be smooth.*

of the ship and want one, but don't fly electrics. With a glow .40, it flies really well. (I have a K&B* .65 in my glow version.) The plane also flies well with the standard Astro Cobalt 25 and 14mA cells.

minutes, I received the signal that power was running down, I landed. For such awesome power, that's a lot of time in the air, and there was still enough power left to taxi back. Flight tests with the SR 1100 Max 16-cell pack, which weighs half a pound less than the 1400 pack, lasted slightly longer than 1¼ minutes—comparably fast, given the lower weight.

Even though the Future Shock was designed for electric power, I've built and flown a .40 glow-engine version. I did this for those who have seen and liked the looks Most of those who have seen videos of the Future Shock flights say that, because of the prop's sound at such high rpm, if they didn't know it was electric, they would have thought it was glow-powered.

Flying is a breeze, and the photos tell the story. The Future Shock responds to commands and will not stall—just drop its nose a bit, and it keeps on coming. It will slow to a crawl as well as rip through the air at full power, and that's a sure recipe for fun—and that's what it's all about.



*The fuselage parts have been cut out and are ready to assemble.*

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

Custom Electronics

# Servo Analyzer

by STAFF

## EVALUATE SERVOS AND LINKAGES QUICKLY AND ACCURATELY

If you're like us, you'd like to know that every sub-system in your favorite R/C model—including each servo—is in perfect working order. If servos suffer from internal gear damage, they will draw excess current. Similarly, if they stall (or threaten to stall) because of binding in the linkage, they will unnecessarily drain your flight pack. As we all know, excess current drain can cut flights short, possibly jeopardizing your aircraft (when a flight-pack discharge curve goes "over the knee" and voltage drops precipitously, the controls go from sluggish to inoperative in a matter of a few seconds). One way to avoid this problem is to ensure that the servos are working at maximum efficiency.

For more than a year, Custom Electronics* has been marketing two servo-analyzing devices that provide a remarkably clear insight into the health of your servos and the soundness of their linkage installation. The Servo Analyzer is a small analog milliamp meter that is plugged into your radio system between the receiver and the servo being tested. A slightly more robust device, the Servo Driver "JSM" (the letters signify that a joystick and meter are included with the driver) operates the servo for you, i.e., without the need for your radio system. Both devices use the same circuit to measure current drawn by a servo.

***This Servo Driver JSM (center) is connected to an ACE flight pack (left) and a standard JR servo (right). The milliamp meter (center) is just beneath the joystick. A center control, which resembles a transmitter trim-tab control, and a throw adjustment pot are inside the servo-driver case. The Driver can be powered by a self-contained battery pack (four alkaline N-cells) or by an external flight pack as shown.***

The small analog milliamp meter provides a continuous readout of from 0 to 400mA of current. Custom Electronics says that the analog readout provides a better opportunity to detect a spike in the current than do digital meters, which periodically reread voltage and update the display. We have found that spikes are quite easy to read using the analog meter.

### OPERATION

Both devices are operated in the same manner. You move the joystick (on the driver or on the transmitter) very smoothly at a rate of about 2 seconds from one extreme throw position, through center, to the other. We noticed that with a standard servo, increasing the speed of the transition can easily bring the current drain above 100mA, but a very slow transition would keep the current well under 50mA. The value of these readings lies in a comparison of the amount of current consumed, not so much in an absolute mA number for a given servo. Take the servo from one extreme to neutral and from the other extreme to neutral, and compare the readings. If you're consistently smooth in driving the servo through its range, but the current isn't, you know you have a problem.

Then compare the readings from one servo to the next and, finally, compare these readings after the servos have been linked to the control surfaces. This procedure will point out many problems associated with servo or linkage installation.

When you test servos that are linked to a control surface, if the current doesn't drop down to near zero when the servo is stopped, you have a bit of a bind. For example, a throttle servo that is experiencing a partial stall can drain 75 to 100 mills of excess current. Remember that when a servo is at rest, the needle should be very near zero (it won't draw zero because of the amplifier in the servo itself). It doesn't matter where the servo arm is resting. Also note that the size of spikes will vary depending on the size of the servo and whether it is a 4- or 5-cell pack (a resistor is supplied should you be testing 6V systems).


***This close-up of the Servo Analyzer shows the logarithmic readout. This device is plugged into the radio system between the receiver and the servo; it utilizes the same test circuit as the Servo Driver shown in the other photo. The needle indicator sweeps forward to register current consumption as you operate the servo. A 25 to 50mA (or higher) current spike in a servo that's disconnected from its linkage—easily observed as a wiggle of the needle—can signify gear damage.***

Another function of the Analyzer is to "ballpark" the amperage that each connected servo will draw while in use (as a result of aerodynamic forces on the control surfaces, in flight, the current drain will be higher). You can add up the combined current to get a rough approximation of the drain of the entire system during operation.

**SERVO ANALYZER**
**List price:** $14.95 (less connectors); $19.95 (with two connectors).

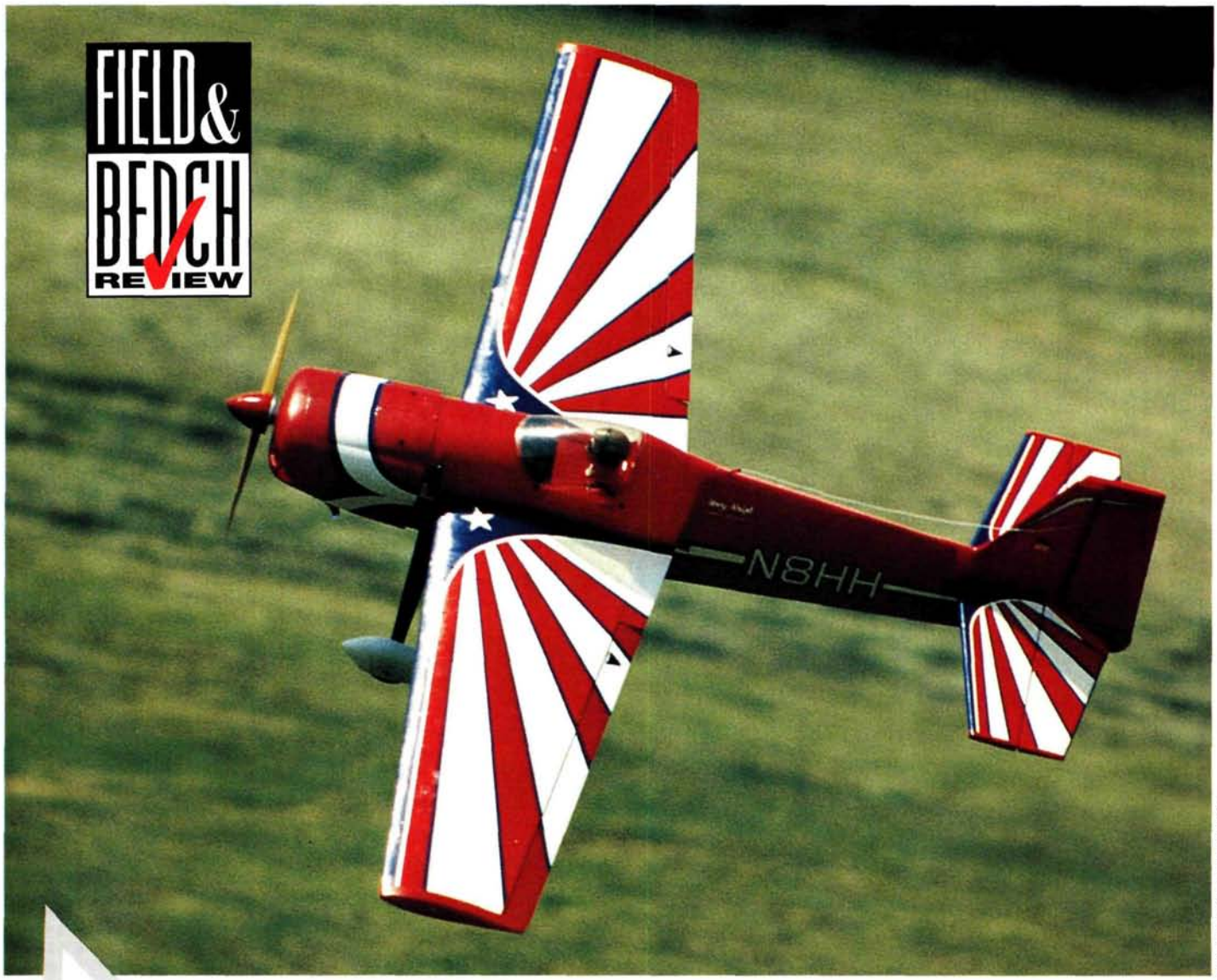
**SERVO DRIVER JSM**
**List price:** $49.95 (less connectors); $54.95 (with two connectors).

### SUMMING UP

Using the device, we've seen a 50mA spike that we couldn't detect visually or by feel. Custom Electronics notes that a crash resulting in a broken servo arm can easily result in such gear damage. You may also wonder about the soundness of your linkage installations. With either of these handy devices, you can get definitive answers—quickly.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

FIELD & BENCH REVIEW




PHOTOS BY DAVID C BARON AND TOM ATWOOD

# Futaba Superstar 90

## OUTSTANDING SCALE AEROBATIC PERFORMANCE IN AN ARF PACKAGE

by DAVID C. BARON

FUTABA'S* VERY SUCCESSFUL Acrostar was a very hard act to follow. But their new model of Harry Haigh's Superstar is another winner, and it simply confirms that Futaba is one of the names you can rely on to deliver good flight performance and quality in an ARF. The kit has the same attention to detail that sets Futaba ARFs apart from their competition. Each part's fit is remarkably accurate, and every glue joint is properly filleted. The aircraft gives you the impression that it was built by modelers, not by assembly-line workers. Before you start to think that this model is perfect, I'll say right now that it isn't; but, in terms of assembly and flight performance, it's the best ARF that this reviewer has enjoyed.


*All dressed up and ready to commit aviation. The Superstar 90 is an attractive, well-designed, super flier—what other ARFs try to be.*

## INSTRUCTION MANUAL

The instruction manual is full of detailed pictures that accompany nearly every step of construction. Nothing is left to interpretation. The instructions are short and clear. At no time did they leave me confused about where a part was or what I should do with it. For the most part, I marveled at the common-sense approach to issues such as the wing center-section bracing, the pull/pull music-wire rudder system and the reinforced tail assembly.

## ASSEMBLY

• **Wing halves and center ribs.** The center ribs serve as a hook that aligns and locks the wing to the fuselage as well as aligning the main spars of the assembled wing. The dihedral brace is made up of three layers of plywood that fit between the wing's main spars and against the entire front face of the spars as far as the second rib. All these parts should be epoxied together to provide maximum durability and strength; I used Zap* Z-poxy for this. After this assembly has dried, it's capped on the top and bottom with a formed-plastic part that hides the joint and seals out fuel. Because these plastic parts often contact the foam-lined covering of the wing and the fuselage, I glued them into place with Satellite City's* thin UFO to maximize the speed of the assembly and prevent the foam parts from being damaged.

*The tail feathers are controlled with these threaded-rod control arms; each elevator has its own horn, and the rudder is set up for pull/pull control.*

• **Fuselage wing mount.** Here, the quality of the die-cut plywood parts was clearly revealed. The fit was perfect, and only a minimal amount of glue was required for a permanent joint. The instructions suggest that you use epoxy when you install these sub-assemblies in the fuselage. I used Zap's Z-poxy in these areas, too.

• **Aileron linkage and servo installation.** The plywood tray fits between the ribs with admirable precision. The tray's front edge butts up against the spar for added integrity. After the aileron servo has been installed, a

## SPECIFICATIONS

**Model name:** Superstar 90
**Type:** sport scale/pattern
**Manufacturer:** Futaba
**List price:** $389.95
**Wingspan:** 63 in. (I measured 64 in.)
**Wing area:** 659 sq. in. (I measured 704 sq. in.)
**Chord:** 11 in. average
**Weight:** 7.5 lb.
**Wing loading:** 24.54 oz. per sq. ft.
**Airfoil type:** symmetrical
**Washout built into wing?:** no
**Length:** 49⅝ in.
**Engine req'd:** .90 4-stroke
**Engine used:** Y.S. .91-AC 4-stroke
**Prop used:** 14x7 Master Airscrew*
**No. of channels req'd:** 4 (aileron, rudder, elevator and throttle; 5 channels req'd. for the recommended two aileron servos)
**Radio used:** Futaba 9ZAPS
**Construction materials:** balsa, foam and plastic
**Special servos used:** 9201–rudder and elevator; S148–ailerons (2) and throttle

### HITS

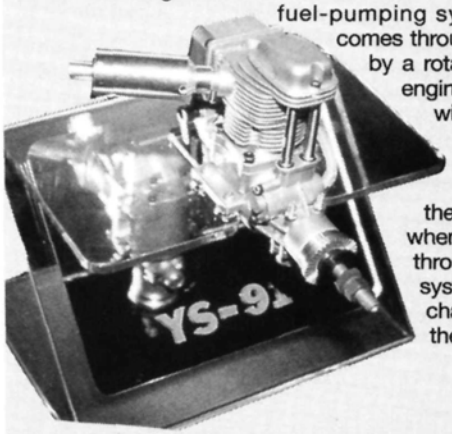
• Outstanding balance of power, weight and wing area.
• Given the quality of the wood and shaped-foam parts, the Superstar should keep its good looks for as long as you respect the power of gravity.

### MISSES

• The plastic parts aren't up to the quality of the rest of the model. The wing and tail-fairing pieces needed a lot of trimming to fit properly, and the pilot and the cowl are a "pain in the empennage" to assemble. If Futaba or any other manufacturer comes out with an ARF kit that has an all-fiberglass cowl, I'll be first in line to buy it!

## Supercharged Y.S. .91—An Engine You Can Count On!

All new large engines are awe inspiring. The Y.S. .91-AC is slightly more so when you realize the potential and value of the supercharger air chamber and the well-known and respected Y.S. fuel-pumping system. The supercharging comes through an air pump that's driven by a rotary valve on the back of the engine. The system works in sync with the downward motion of the piston and creates a major dose of crankcase pressure. This pressure is then fed to the air chamber, where it's mixed with the fuel fed through the double throttle-valve system. The result is a great charge of fuel and air, ready at the intake valve when it opens.




Hand-cranking an engine of this size isn't safe—even for experienced modelers—so use a starter or a chicken stick. As for cold starting with a chicken stick, I found that the engine runs with the needle about 1½ turns open. When the engine is cold, I open the needle an additional turn and flip the engine over with the carb set at full throttle (with no power to the glow plug) until I hear the sound of the fuel in the engine (five or six flips). This is because with a cowling, it is awkward to prime the engine. I then close the needle back to 1½ turns, retard the throttle to idle and hook up power to the glow plug. The first flip usually gives good results.

Hot starts are also at idle, and I found that it takes a few more flips to get the engine to fire. I always grip the prop as I pull it through compression the first time—hot or cold—to determine whether the engine is over-primed and prone to kicking.

I must say that the Y.S. .91-AC has set a new standard for quality for large-displacement engines. It has been easy to start and operate from the first run and has yet to quit unexpectedly. I've never shown it my electric starter; it needs no such threats!

## FLIGHT PERFORMANCE

*This model's first flight broke some of the rules that I usually live by. I don't like to have more than one un-tested variable involved in a maiden voyage; I never fly a new engine, a new radio and a new plane at once. To some extent, this is a personal thing, but I learned this system the old-fashioned way—at the school of broken balsa. With the Superstar, I had a new engine and new airplane to keep whole so that it would still be pristine for the flight shots. It isn't so much that I was worried about the worthiness of the plane in the air, but rather that the performance of an engine is only as good as its installation and accompanying fuel setup will allow. In this case, I checked and rechecked the fuel system. I ran the engine on the ground and held the plane in every conceivable unusual attitude. The Superstar performed flawlessly. The engine was (and still is) exceptionably reliable. It has yet to stop unless commanded to do so. It's very easy to start and was reliable right out of the box. My hat is off to Y.S. (see the sidebar, "Supercharged Y.S. 91—An Engine You Can Count On!").*

### • Launching, takeoff and climb-out

The Superstar taxied marginally on my club's rough grass field. The wheel pants are certainly more suited to hard-surface runways. I kept full aft stick on while I moved into position at the end of the runway, and many times, I had to use all the rudder to steer. It never did nose over, but subsequent takeoffs were accomplished without much taxiing, and I simply carried the plane to the end of the runway and took off from there.

Takeoffs are "right now." The Superstar isn't a heavy plane, and any modern .60 or larger 2-stroke, or .90 or larger 4-stroke will pull it into the air rather spontaneously. If you're a purist at keeping it on the runway heading, the plane likes a little right rudder. If you ignore the right rudder, the plane doesn't lead itself into any bad habits. You can just fly it out on the ailerons and elevator alone. The Y.S. .91 has the potential to take the plane vertical directly from takeoff. This impresses spectators, but remember, you should let any new aircraft and engine earn your trust. Showing off is sometimes the hard (not to mention embarrassing) way to discover the reliability of a new plane and its systems.

### • Trimming

The model was very close to being trimmed—certainly not a handful while I explored the first few seconds of flight. The most significant post-flight change that I made was to add exponential to the ailerons. I did this instead of reducing the rate of throw because I like the full deflection roll rate of the ailerons. They were, however, too sensitive close to neutral. This was most noticeable on landings, and during maneuvers at slow speeds, the ailerons were too "hot" for me to make small corrections. My attempts to keep the wings level at touchdown were, at first, over-controlled. I attribute this to the minimal gap and overall quality of the factory hinging, as well as the ratio of aileron area to wing area. After some experimentation, I ended up with a value of negative 20 percent exponential, and the plane felt really natural. (Keep in mind that this is a Futaba value; other radio manufacturers don't have negative values in their exponential systems.)

I also increased the rudder throw to enhance tumbling maneuvers.

### • Stalls/low-speed flight

The Superstar has a very predictable stall that squeezes every knot of air speed out of the model before it breaks. Recoveries are swift, owing to the reasonable wing loading and the model's power-to-weight ratio.

### • Stalls/high-speed flight

Unless I get absurd with the elevator throw, this plane tries to fly through the tightest full-throttle loops and turns that I can hammer it with. In maneuvers such as square loops, it will eventually snap out, but again, the maneuver is accomplished perfectly with only a slight reduction in elevator travel.

### • Speed range

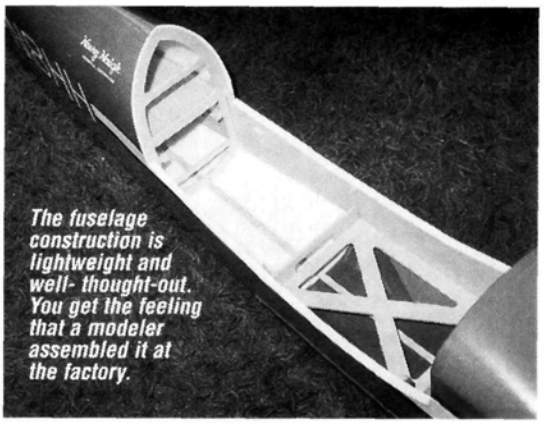
The Superstar's speed range is remarkable for this type of model. We have a lot of Quickie 500 racing at our field, and for fun, I got into a race with a guy who was practicing. The Superstar is a big model compared with these little screamers, and it was definitely outpaced down the stretch—but not by the margin that you might expect. Its tight turning capability and abundance of power prevented it from being humiliated in the dust of a hot little Quickie.

### • Aerobatics

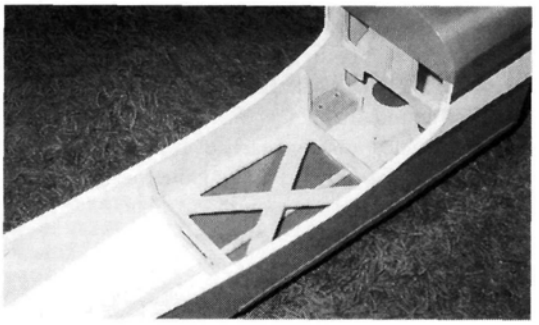
Of course, this is what the Superstar does best. It's like a recipe that says, "Just add fuel and have a blast." The plane just feels balanced. In pitch, it tracks beautifully until you tell it to tumble with a kick of the rudder. In roll, it's axial and true at high rates, and slow horizon-to-horizon maneuvers are a joy. Snap and spin maneuvers are predictable when you carry a little power, but the plane tends to over-rotate when you're idling or in dead-stick flight. My favorite maneuver is consecutive "avalanches" (loops with a snap on top). These are most impressive when their bottoms are right down on the deck and their snaps on top appear to be a bit too low for a safe recovery.

### • Landings

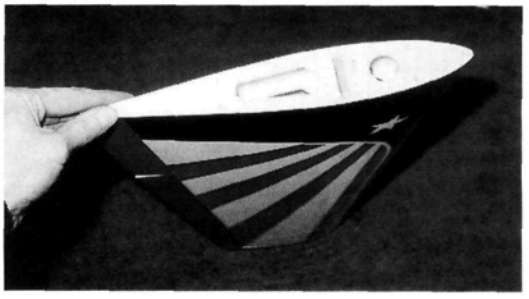
Because the Superstar can fly so slowly, it can get into trouble before it appears to be in trouble. I use an approach that stays hot (fast) by using a notch or two of throttle. I then let the speed bleed off and go to idle only when the model is down on the deck and at an altitude that's fit for flaring.



*The fuselage construction is lightweight and well- thought-out. You get the feeling that a modeler assembled it at the factory.*



***The durable Superstar is light where it has to be light and strong where it has to be strong. Notice the healthy landing-gear mount block and the generous lightening holes in the plywood formers.***



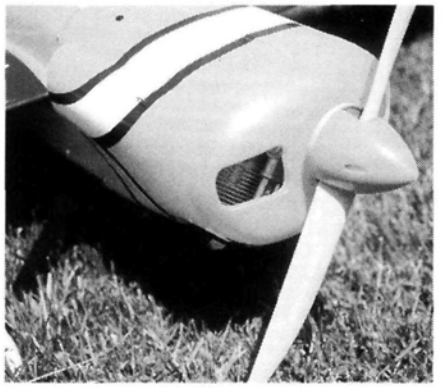
***Designed with the same attention to detail as the fuselage was, the wing is strong and light. It's covered with traditional pre-printed, laminated foam ARF material.***

section of the decal sheet is used to cover the bottom of the wing. All you do is align the covering with the stars printed on the wing, cut a hole in the covering for the servo's output shaft, remove the backing sheet and press it into place. Any wrinkles can be removed with a heat gun.

• **Landing gear and wheel pants.** These are straightforward and rugged. The one-piece aluminum landing gear is solidly attached to the fuselage with nuts and bolts. A slot in each of the wheel pants enables you to align and secure them to the landing gear after the axle and wheels have been installed. This setup prevents the wheel pants from rotating while the model is flying.

## FIREWALL FORWARD

The engine installation for the Superstar is simple and straightforward. I used the provided engine mount and was pleased with the overall integrity of this system. After careful measurement, to



***One of the few faults I found with this kit is that its three-piece plastic cowl is difficult to build. It isn't up to the same level of excellence as the rest of the model. A one-piece fiberglass cowl would be a big improvement.***

remove some up and left thrust, which could have adversely affected my model's flight performance, I shimmed the engine mount with one medium washer at the two-o'clock position.

The three-piece plastic cowl is assembled with CA. I used Zap's Plasti-Zap for this; I don't think any other glue does as good a job on plastic parts. In my experience, glued plastic parts tend to take longer to set than balsa parts. Usually, while it's setting, the glue seeps out where you're holding the assembly. Murphy's Law says that the glue will set on your fingers 10 seconds before it sets on any joint. This being so, if you move your fingers, you'll shift the alignment of the pieces you're trying to bond. I used tape to hold the cowl together overnight until the glue set, and I used a minimum. Once the cowl was able to hold its shape, I reinforced the seams with the supplied fiberglass tape, and I ended up with a decent-looking product. I'm grateful that the decals cover most of the joints and hide a terrific set of my fingerprints (complete with skin!). A plastic cowl of this type is certainly inexpensive to mold and an easy way out for manufacturers, but it really doesn't match the quality of the rest of this model.

## TAIL SECTION

Mounting the stabilizer and the rudder is simple, but it requires a substantial amount of careful alignment. The tail assembly is then capped with a plastic tail-fairing piece. In my kit, the piece's length was off a little, so I had to remove the section that was intended to wrap around the back of the stabilizer. Functionally, it's fine, but cosmetically, it falls a bit short.

The tail wheel is a work of art. It's functional without being heavy. This may sound trivial, but other ARF manufacturers should pay this much attention to detail. Remember, an extra 2 ounces in the tail-wheel assembly may require that you add an additional half pound of lead to the nose. This makes things worse if the plane is already in need of nose weight.

## CONTROL SYSTEM

The radio installation for the Superstar is simple and logical. Everything has a place, and the suggested equipment location doesn't disturb the CG. I was especially impressed by the pull/pull rudder installation. Instead of using a traditional cable system, this system uses lighter-gauge music wire. The advantages are that this system is lighter, and the bent-over and crimped ends of the wires can't pull out in the way that Kevlar cord and braided cable can. I'll be using this idea on my next plane.

Final steps include assembling the pilot, which is as much of a nuisance as assembling the cowl. The pilot must be painted, and the finished product bears a striking resemblance to well-known pattern flier Dave Von Linsowe. (Well, at least I think it does.)

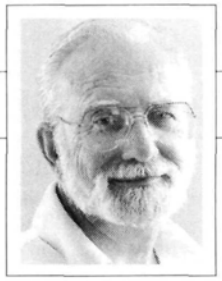

***The Futaba Superstar 90, as it comes out of the box. The overall quality and fit of the parts are very good. It doesn't take long to put this one in the sky.***

## CONCLUSION

Enjoy! Try not to show off too much. The Superstar is a crowd-pleaser and begs to be wrung out in every flight. If there's air speed, the plane will do exactly what the stick tells it to do. So, because it's the sentinel of your thumbs, it will show the world whether you know your stuff. The Superstar will perform right up to the limit of your capabilities. Expect to try hard to find the limits of *its* capabilities in a single season.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

# How To:

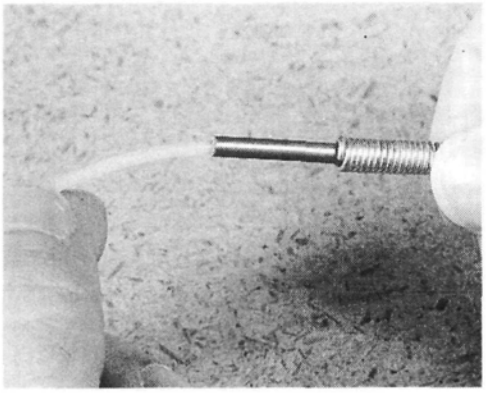


RANDY RANDOLPH

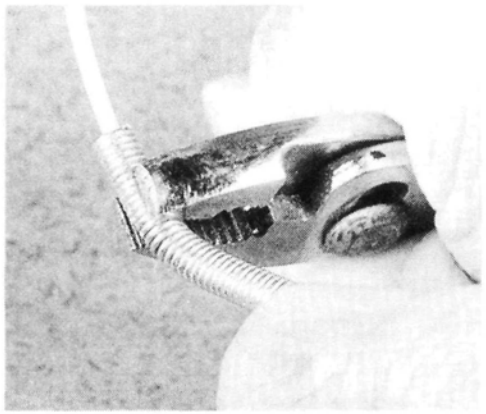
## BEND BRASS AND COPPER TUBES

*Whenever you build an airplane that has an internal fuel tank, you have to bend copper or brass tube, and for most of us, that's a real chore. Used as shown here, the K&S* Tubing Bender Kit offers one of the best ways to do this.*

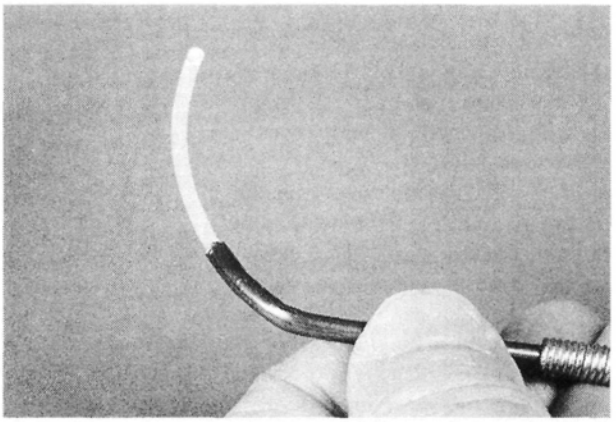

***1. You'll need a Bender Kit spring tool of the correct size (in this case, ⅛ inch diameter); ⅛-inch-diameter copper or brass tube; and a length of .050- or .060-inch nylon line (.090 inch for wider tube) of the type that's used in lawn-edging tools. The line, which makes this bending method almost foolproof, should be twice as long as the tube.***



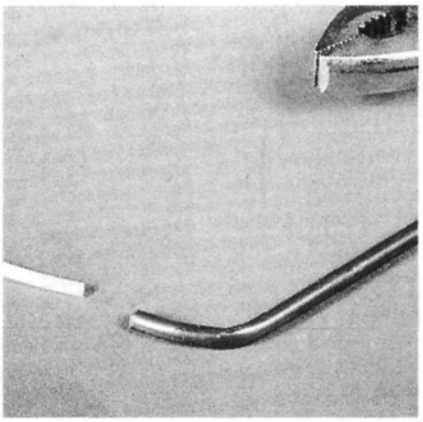
***2. Insert the tube into the bending tool, then thread the nylon line through the center of the tube. Make the bend toward one end of the tool so that the tube will be easier to remove when it has been bent.***



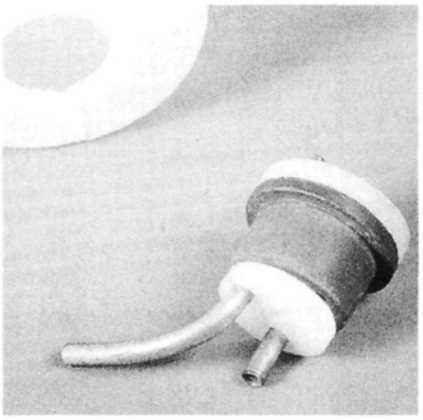
***3. Use pliers to bend the tool and the tube. Gradual bends are easiest to make, but sharper bends can be made in soft copper tube. The nylon line prevents the tube from collapsing in the middle of the bend.***



***4. Having made the bend you need (this one is for a fuel-tank overflow line), remove the bending tool by twisting it so that it threads itself off the tube.***



***5. Pull the nylon line out of the tube. If you've made a sharp bend, you might have to hold the tube with pliers or even a vise.***



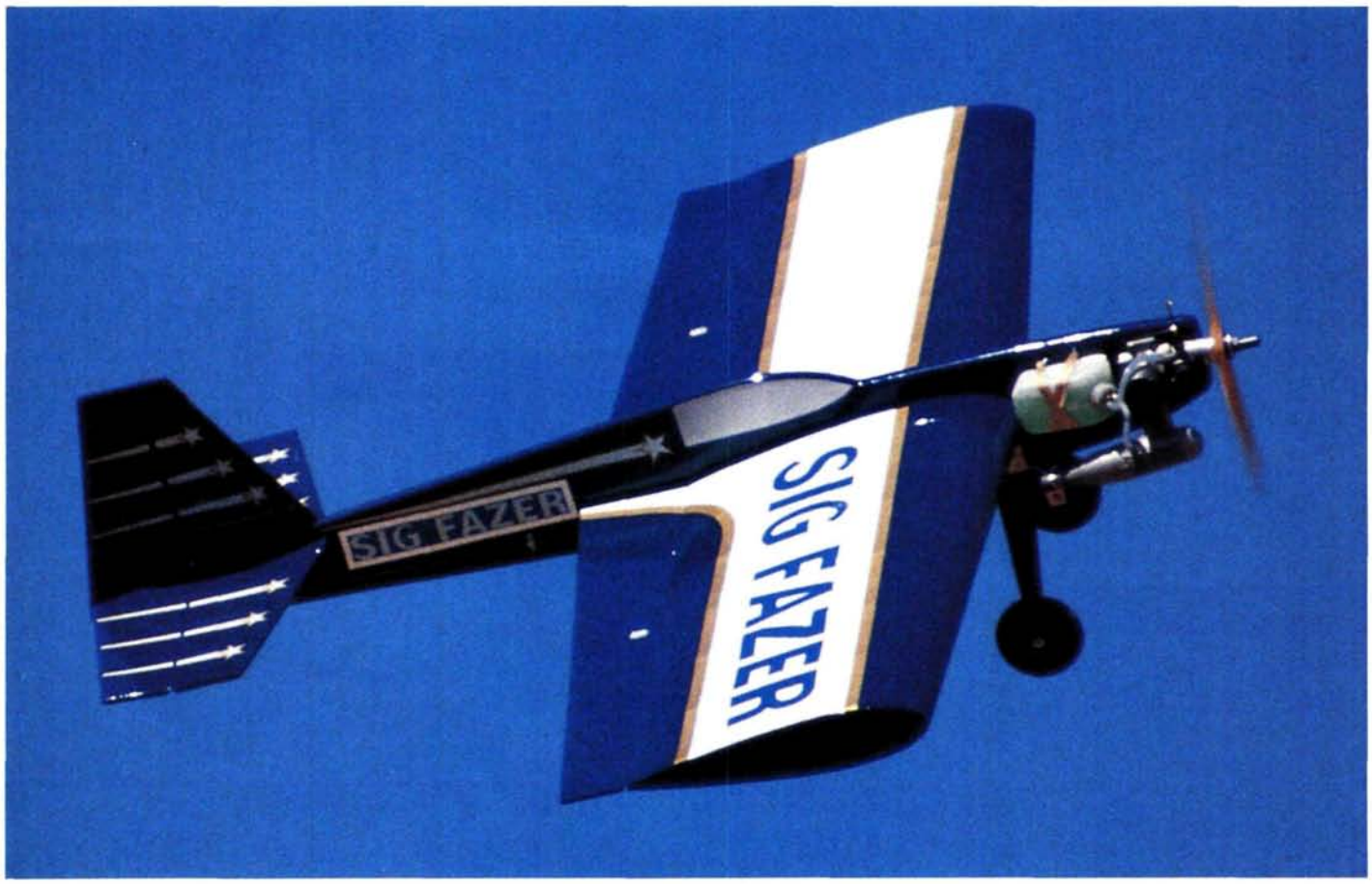
***6. Cut the tube to the length you want, and sand or file its ends smooth so they won't cut the rubber fuel line when it's pushed over them.***

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

FIELD & BENCH REVIEW

HALLELUJAH! With its Fazer, Sig* has saved us from those dopey-looking fun-fly aircraft that resemble Hershey bars with Popsicle sticks stuck in them. You know the kind. They taxi like drunk ducks. They flip and flop instead of looping and rolling. Not only are most of them ugly, but here in Albuquerque, NM, the consensus is that they set R/C modeling back 30 years! *[Editor's note: this is clearly the author's opinion only!]*

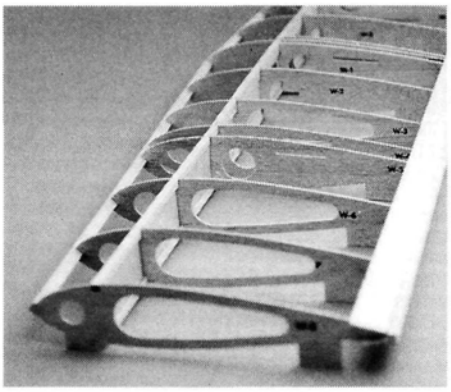
So, to Sig Mfg. Co. and designer Mike Pratt, we all say thank you from the bottom of our fun-flying hearts!




# SIG FAZER

## A super fun-fly design with personality

by JIM SIMPSON



*The wing is built upside-down on the workbench. Construction is quick and easy. Notice the building tabs.*

## FIRST FLING

I first saw the Fazer in January '94, when the Sig, Ace and Byron trade-show units stopped here in Albuquerque en route to Los Angeles. My old friend Jim Porter flew the Fazer several times and really put on a show. At the time, I thought it was a pretty neat plane, but there was no time in my schedule for building it.

Not long afterward, a Fazer kit appeared at a local hobby shop. Naturally, I was amenable to doing this review, and I vowed to make time to build the Fazer. The kit was delivered on a Thursday; I cleared off my workbench on Friday evening and built the kit on Saturday. It took all day. I read and followed each step, too! During the following week, it was very windy (even at night), so flight testing had to wait until Saturday.

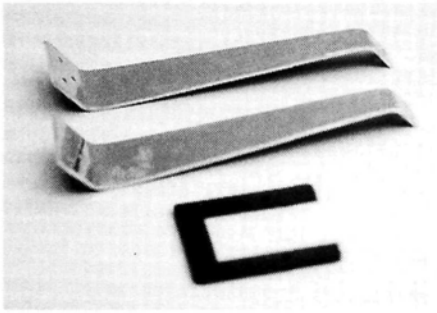
## CONSTRUCTION NOTES

Start with the wing, which is built upside-down. Take time to ensure that the wing ribs are spaced exactly as shown on the plans. If the 1/16x1x24-inch balsa trailing-edge sheets aren't rock-hard, it may be worth your time to replace them or add webs at the front edge between the ribs. (I accidentally cracked this stock while handling the plane.) Also, be careful to cut the servo hatch openings in the bottom (not the top) of the wing. When the wing is finished, you'll be nearly finished with construction.

The tail surfaces and the ailerons are simply built-up stick frames. The profile fuselage requires only the addition of engine bearers and plywood doublers and a final rounding off of the corners. Big deal, huh?

## COVERING AND FINISHING

Covering and final assembly are very well-detailed, with plenty of pictures; there's nothing I can add. I painted my Fazer dark blue with white and gold trim, like one of world champ aero pilot Leo Loudenslager's earlier paint schemes. When I had added

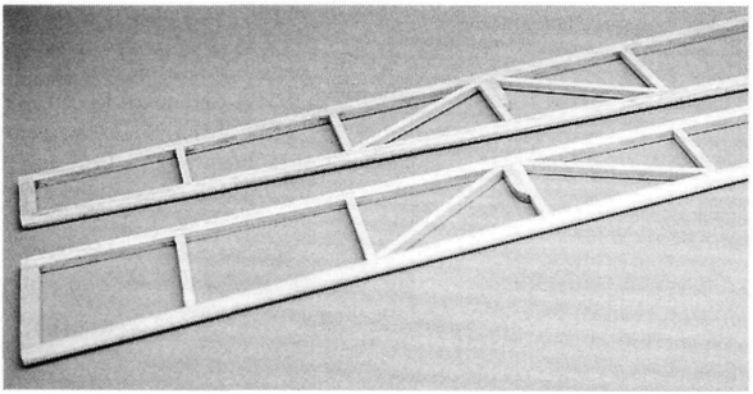


*The Fazer's landing gear and engine mount are light and simple in design.*

the decals, I noticed that the dark blue showed through the white and gold (the decal white didn't quite match the trim-sheet white). But that doesn't at all affect the flight characteristics, which is what this plane is all about.

## FINAL SETUP

My plane weighed 4 pounds with the Thunder Tiger* GP .40 engine in it. I used an Ace R/C* MicroPro 8000 radio. Although I've used many of the system's fine functions, the Sig Fazer is the first plane I've flown that uses them all. I programmed the transmitter as recommended on page 25 of the Fazer's "Building and Flying" manual. It seems to me that this plane



*The ailerons are simple stick frames.*

## FLIGHT PERFORMANCE

### • Takeoff and landing

The Fazer needs a little right rudder on takeoff, as most sport planes do.

I used a Thunder Tiger GP .40 ABC engine and a CG only slightly ahead of that shown on

the plans. The landings were nice and slow, which inclined me to go back "upstairs" to do another stall series, just to reset my confidence level. Man, this is some plane!

### • Low-speed performance

This is where the Fazer really shines. With its relatively light wing loading and humongous control surfaces and throws, it's very responsive and tough to stall. Enter the rate switches. If you have them and like to use them, they'll improve your flying. Good low-speed performance makes spot landings easy and prevents the plane from getting away from you while you do repetitive maneuvers. The Fazer will also do well in differential-speed events. Its low-speed performance is truly outstanding.

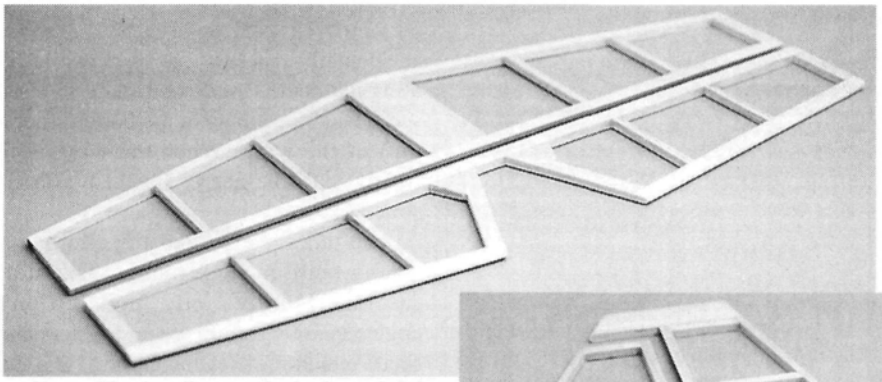
### • High-speed performance

For this plane, high speed as in Formula One isn't in the cards, but the Fazer is faster than other fun-fliers. I flew it with a 12x5, an 11x5 and, now, a 10x6 prop. (Sig recommends APC* 11x3.5 and 11x4 props.)

### • Aerobatics

The Fazer loops like a Ukie, rolls like a wheel and spins like a top. Because all other aerobatic maneuvers are combinations of these, your plane's performance will reflect your skill. To enhance my Fazer's aerobatic performance, I used sealed hinge lines and an Ace R/C MicroPro 8000 computer radio. I have it set up so that every stick, lever and switch on it does something. To get used to this hot-dogging, I started with the balance point on the main spar and, after several flights, I moved the CG back an additional 1½ inches to the CG location shown on the plans. Loops aren't as tight as on a "competition fun-fly" model, but this was designed as a sport fun-fly model; and for a sport model, loops are tight.

## SIG FAZER



***• Above: like the ailerons, the horizontal stab and elevator are built up of sticks. • Right: How long does it take to build the vertical stab and rudder? Not very!***

### SPECIFICATIONS

**Model name:** Fazer
**Type:** fun fly
**Manufacturer:** Sig Mfg. Co.
**List price:** $69.95
**Wingspan:** 48 in.
**Wing area:** 697 sq. in.
**Weight:** 3½ to 4 lb.
**Wing loading:** 14 oz. per sq. ft.
**Airfoil type:** symmetrical
**Washout built into wing?:** no
**Length:** 40 in.
**Engine req'd:** .25 to .40 2-stroke; .40 to .50 4-stroke
**Engines used:** O.S. .40 FSR; Thunder Tiger GP .40 ABC
**Rec. engine and prop:** .32 Webra or .34 SuperTigre; 11x3.5 or 11x4 APC prop
**No. of channels req'd:** 4 (aileron, rudder, elevator, throttle); 5 servos req'd.
**Radio used:** Ace R/C MicroPro 8000
**Wing construction:** built-up balsa
**Fuselage construction:** pre-shaped ½-inch balsa sheet (profile)

**Features:** includes full-size CAD-drawn plans; easy to build; all-wood design with pre-shaped profile fuselage; die-cut ribs and doublers; formed-aluminum landing gear; a glass-filled engine mount; Sig Easy hinges; three decal sheets; a complete hardware package; and a photo-illustrated instruction booklet. The Fazer fuselage is precision cut for tight, accurate parts fit.

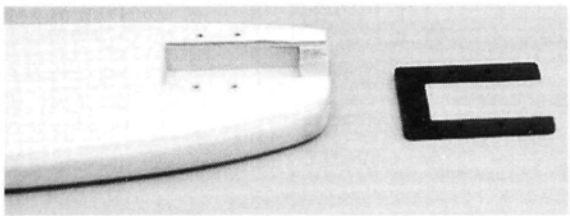
**Hits**
- Excellent flight performance.
- Good looks.
- Lightweight.
- Good ground handling.
- Pre-shaped profile fuselage.
- Easy to build.

**Misses**
- Color decals aren't completely opaque. *[Editor's note: Sig has told us that this problem will be fixed in the next run of decals.]*

and radio were made for each other.

### ENGINE NOTES

The Thunder Tiger was a real surprise. It fits the same mounting holes as an O.S.*, but it's about 4 ounces lighter: it has no ball bearings, a lighter frame, a smaller muffler, etc.



***To build the fuselage, simply glue in the engine rails, glue on the doublers, drill some holes and round off the corners. That's all!***

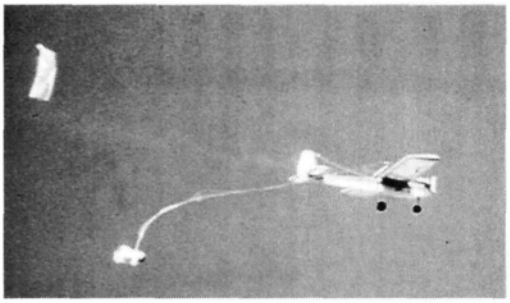
I figured that it would take an entire morning to break in the Thunder Tiger. Not so. I filled the 4-ounce tank and started the engine. It took three tries to get the needle set and the idle adjusted properly. The engine sounded so good and responded so well that, with only 2 ounces of fuel gone, I launched the Fazer and expected it to die lean. Didn't do it. I flew the plane for the rest of the day and had no engine problems.

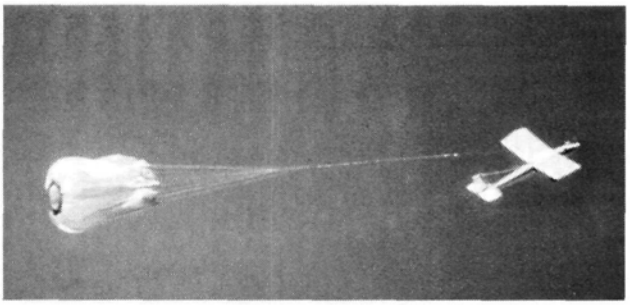
### VARIATIONS

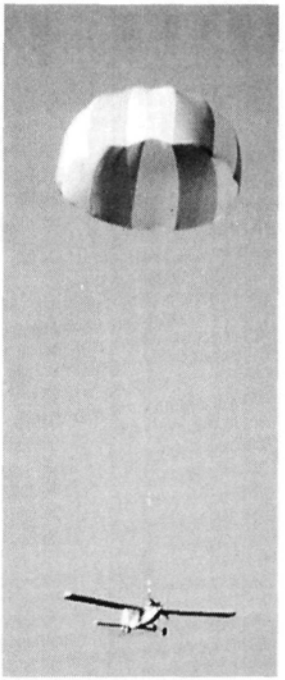
Those of us who have owned a 4-stroker will naturally consider installing one in the Fazer. No problem. Page 26 tells how. Also, a mere glance reveals what a great control-line plane it would make. Again, no problem. The conversion, including pictures and flying instructions, is also covered in the manual.

The last paragraph of the manual is the best "read and heed" I've seen in a long, long time. Do it!

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■







***Here's the complete operation of the chute-release mechanism and the successful deployment of the chute. During your first few attempts, get at least 200 feet high, and set the throttle at idle with the engine completely shut down.***

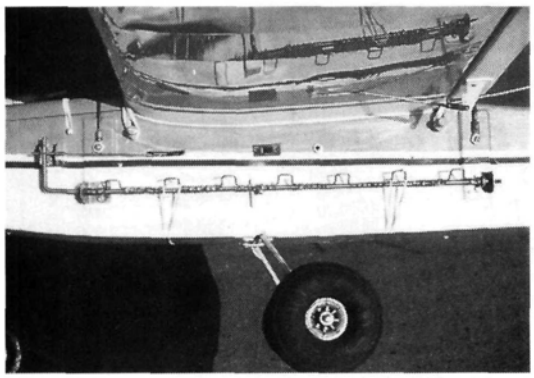
# Padre's Parachute

## PART 2

**by REV. WAYNE KOBES**

**SAFE AIRCRAFT RECOVERY AND SPECIAL OPERATIONS**

*Editor's note: the Rev. Wayne Kobes (hence "Padre") first wrote about his parachute mechanism in our October '71 issue. Padre showed us then how he licked the problem of the small-field landing in a unique and practical way. Since then, he has improved the parachute mechanism, and here, he shares its design and some of his experiences with the new, improved "Padre's Parachute."*



***The release-mechanism wire is mounted on the side of the fuselage. Here, the small trip wire holds the larger release bar in place. The U-shaped wires that have been soldered to the bar hold the rubber bands in place.***

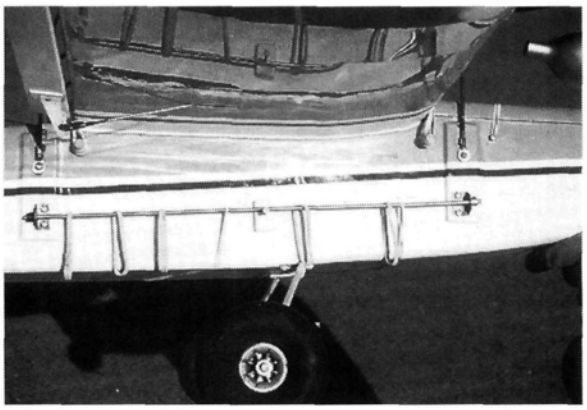
IN THE LATE 1930s, I was at a free-flight, gas-powered model contest in Winona in southern Minnesota. I was in front of my Megow Quaker Flash starting the reliable Ohlsson Gold Seal motor that was mounted in its nose. This was no ordinary Quaker Flash; inside its fuselage were an old alarm clock and a 5-foot parachute. I had always loved parachutes, and I thought it would be a great and unique event to let the Quaker drop to the earth tethered to the chute. I had spent about two weeks constructing the chute and revising the alarm-clock motor so that when it went off, it would wind a spool of thread and open the chute trap door.

The wind was severe. Several planes in the contest had already bought the farm. In those days, free-flight models were at the mercy of the elements. As I flipped the prop, I prayed that it wouldn't start. The next thing I knew, however, the God I had learned to love had let me down, and the Ohlsson barked into a beautiful crescendo. The moment of truth had arrived.

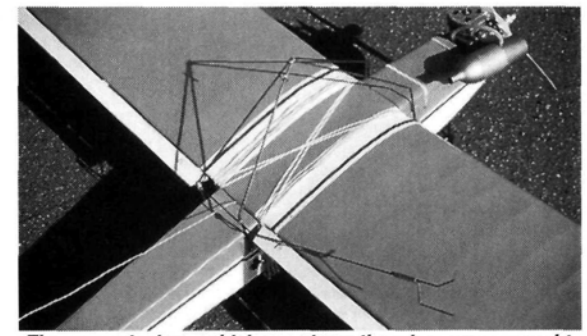
Too many spectators were waiting for the "kill." Beads of sweat were on my brow; I held my breath. I released the Quaker, and it moved ahead against the wind. It lifted off. I foolishly tried to keep its wings level with all kinds of body English. It rose to about 50 feet or so and made a left, downwind turn. At least it was flying and seemed under control. I found myself praying for altitude: "Dear God, with all celestial grace, lift this bird to its heavenly place!" Then came the answer that made me tremble:

*"Wayne, you big dummy! You have adulterated the wing-loading guidelines I have established [weight of the model in ounces divided by the area in square feet]. The added weight of the clock release and parachute make it very difficult to answer your prayer because I must compromise my own laws of flight! But maybe, just maybe...."*

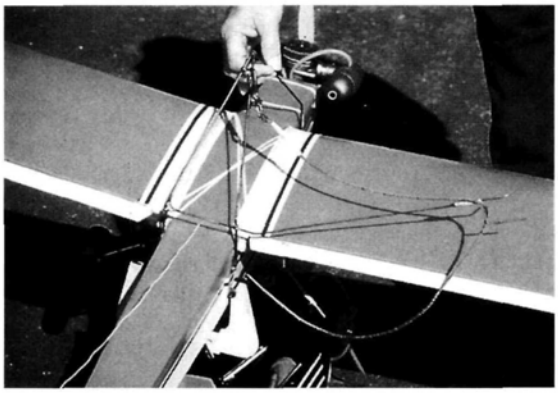
I had the engine timer set for 30 seconds and the parachute release set for 20 seconds. The bird turned to the left once again into the wind. It gained some precious altitude—but not much. Then the chute release went off, opening the trap door. The chute fell free with the shroud lines trailing behind. Then the engine quit. By then, the chute had been fully deployed. The Quaker



***On the opposite side of the fuselage, this anchor bar secures the ends of the rubber bands. On both sides of the fuselage, the bars are held in place with brass L-brackets.***



***The support wires, which are above the wing, are secured to the fuselage with screws in front of and behind the wing's leading and trailing edges. Notice the attachment ring at the top of the supports.***



*The parachute shroud lines are secured to the ring with a swivel snap hook. The shroud lines are looped over the anti-tangle yoke so that they don't interfere with the wing when the chute is released.*

"reared back" under restraint and made a perfect drop of about 25 feet. Eureka! The bird landed, and the chute, still filled with air, dragged the Quaker across the ground but, fortunately, someone restrained it.

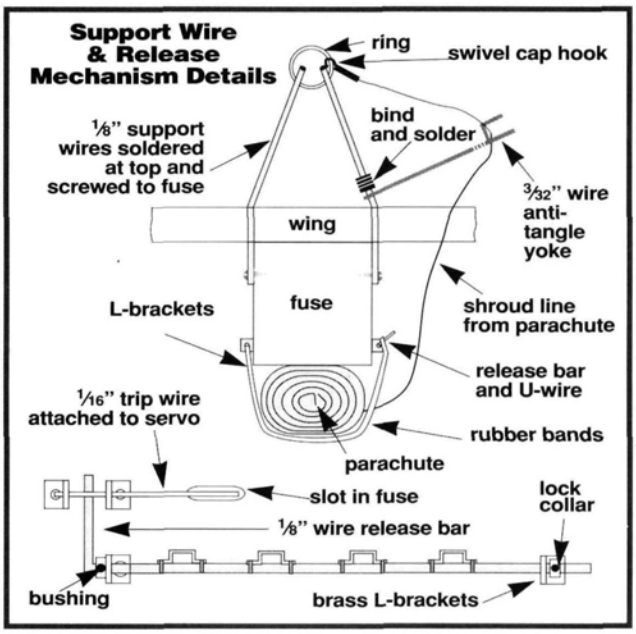
The contest was over. Some received prizes and were photographed, while others, with long faces, were still picking up what was left of their models. Down deep, I felt happy and rewarded at the flight but, to my surprise, I was called over the PA to come forward and receive a prize for the "best stunt of the day."

## PADRE'S PARACHUTE 2

It was this early success that promoted me once again in 1972 to create a bird that would do the same as its predecessor; only this time, it would be easier because of R/C (so I thought). This Padre's Parachute was featured in the October '71 issue of *Model Airplane News*. It drew a good response from readers, and some wrote asking for details. But the days of flying for Padre's Para-chute were not over. In fact, to this very day, it hangs in my workshop and is flown regularly.

## PROBLEMS SOLVED

The original design of the release mechanism used on my Carl Goldberg Falcon 56 was foolproof, never once failing to release the chute. Only two problems emerged. The first was that sometimes the chute's shroud lines became wedged in the fabric of the chute. I corrected this by wrapping wax paper around the packed chute prior to wrapping the shroud lines around the chute itself, and then wrapping the entire chute assembly with wax paper to protect it




*When trip wire is pulled, the release bar rotates and releases the rubber bands.*

# Construction Notes

**If you'd like to give parachutes a try, consider this:**

- **Engine. It's better to have too much power than not enough. The added weight and drag of the parachute and the release mechanism will slow you down, and you won't be able to control the model as effectively.**
- **Chute size. A 9-foot-diameter parachute with a 16- or 18-inch air-escape hole will safely support up to an 8- or 9-foot-span model. I suggest a 6-foot-diameter chute for 5-foot-span or smaller models.**
- **Material. Use any light, strong material you have available. I used nylon, but I also think that some form of plastic sheet material could be used successfully.**
- **Shroud lines. The shroud lines can be made out of simple cotton twine or kite string. I don't recommend nylon string as it has a tendency to kink and is very difficult to untangle.**
- **Shroud attachment. I used small buttons as anchor points on my chute for the shroud lines. You'll eventually have to replace the lines, so don't sew them to the chute. You might be able to use small plastic or rubber grommets instead of buttons.**

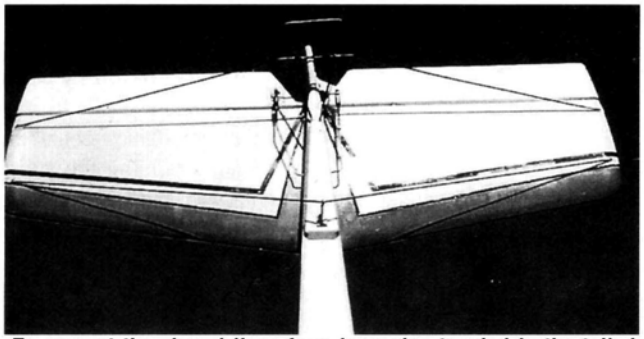
**Chute packing**

- **Make sure that all the shroud lines are straight and untangled. Stretch the chute out on the ground and fold the sides over until the main body is approximately 8 inches wide.**
- **Roll the chute up loosely from the top to the bottom, and gather the shroud lines toward the center of the chute.**
- **Wrap the chute with wax paper, and then wrap the shroud lines around the center of the chute body. Don't try to evenly distribute the lines when you wrap them around the chute.**
- **Leave enough line (with the snap clasp attached) exiting from the rear to reach from the chute, around the wing, into the yoke wire and up to the attachment ring.**
- **Cover the entire chute with wax paper, and place the packed chute under the model at or slightly in front of the CG.**
- **Stretch the hold-down rubber bands around the chute, and slip the rubber bands over the U-wire release tabs.**

**Chute operation**

- **Take off into the wind, and gain plenty of air speed before you attempt to turn.**
- **Climb to at least 200 feet for the first chute release.**
- **Kill the engine before chute deployment. If the engine is still running when the chute opens, you may find that the model tends to swing from side to side. I tried a drop with the throttle set at ½ to try to guide the descent, but was unsuccessful.**
- **I think that manipulating the shroud lines and the spillage of air from the chute controls the descent better than using engine power.**

*HUFFNPUFFIN makes training chutes for joggers and runners—used to increase drag as the user runs. This company sells approximately 5- to 6-foot-diameter chutes (without the running harnesses as well). Perhaps readers can use these chutes, which cost $84.95, in a model aircraft application. Contact HUFFNPUFFIN, P.O. Box 15723, Kenmore Sta., Boston, MA 02215; (800) 700-7833.*



*To prevent the shroud lines from becoming tangled in the tail, I installed these wires, which help the lines slide clear of the tail.*

from exhaust oil and also to prevent the hold-down rubber bands from getting tangled in the chute fabric.

The second problem developed when the deployed chute's shroud lines wrapped around the tail section of the model. This resulted in a descent with the nose pointing straight at the ground. The bird was never damaged because the chute was so large that it lowered the model very slowly. I corrected this by installing clearance wires beneath the tail and by installing an anti-tangle yoke about 18 inches out that swings the shroud lines away from the fuselage when the chute is released (see illustration for details). This works perfectly, and the model lands on its wheels every time.

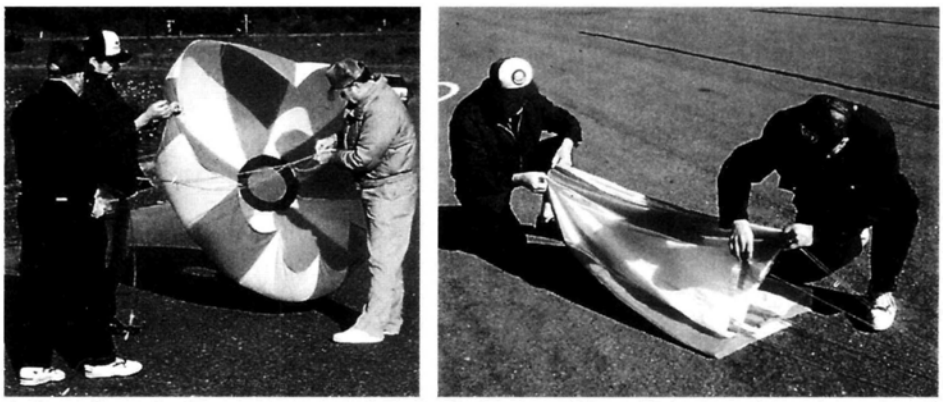
Over the years, the Padre's Parachute-equipped Falcon has had many illustrious, exciting flights. One time, the wind changed and blew the descending bird into a lake. Splash! What to do? There wasn't a boat around! In desperation, I took all my clothing off except my shorts and swam out to recover it. On my way back with the Falcon, however, I noticed that a crowd had gathered on the shore. There I was, in only shorts, still in the water. Fortunately, a boy of about age 10 saw my plight and waded out to me in waist-high water. He pulled the plane and the chute to shore while I swam about 100 yards along the shore and was able to beach in a clump of bushes. All's well that ends well. Everything was soaked, including the radio, which I thought was ruined. The Cirrus radio I had in it at the time functioned perfectly after I had dried it out, however. This was a remarkable radio. I never had to have it serviced until 1991, and it still functions perfectly.

On numerous occasions, the bird has landed in the trees. I've always been able to recover it without too much difficulty. However, one time, it landed in a grove of tall Douglas firs, and I couldn't find it. The next morning, I rented a Cessna 150 and flew over the area. I spotted Padre's Parachute nestled in the top branches like an eagle's nest. Getting it down was much more difficult than finding it!

## CAP WORK

In Hood River, OR, I belonged to the Civil Air Patrol (CAP) and used the Falcon to drop supplies (first-aid kits, small tools, walkie-talkies, etc.) to CAP rescue climbers. I also flew a "feeder line" across a canyon so that additional equipment could be pulled across. Often, supplies have to be carried or dropped by aircraft to climbers on the side of a mountain.

I made several dry runs and attached the payloads to the Falcon's belly. The flights were coordinated by an observer at the base camp and another at the drop site. The Falcon was guided to the drop site by the observers, who communicated using semaphore flags. As the model approached the drop site, the observers told me to go left, right, up, or down. When the position was right, I dropped the payload and returned the craft to the base camp. The Falcon was so reliable that I could hand-launch in a small clearing for the rescue operations and then do a short-field stall-landing into a patch of long grass or bushes.



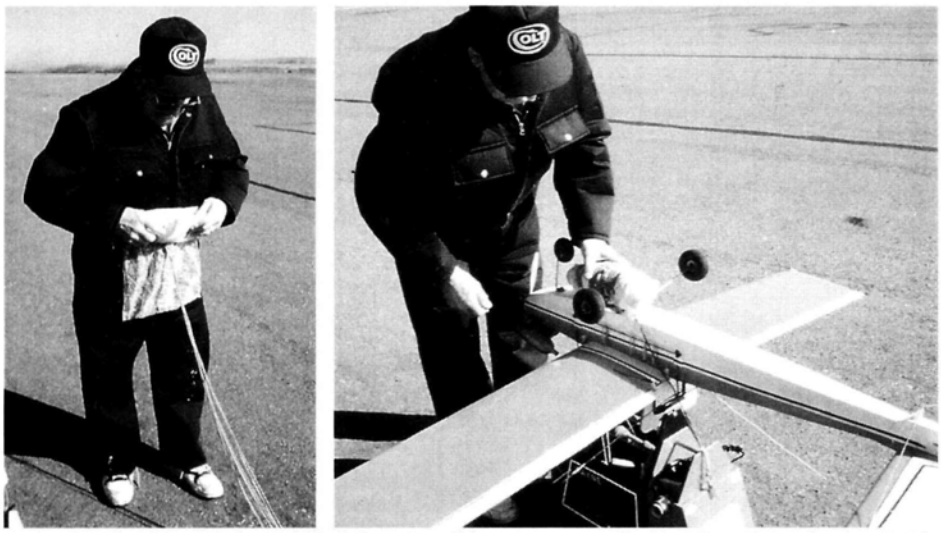
*Left: you'll need a few assistants to help untangle the shroud lines. Right: to pack the chute, place it on the ground and neatly fold it over and over until it's about 8 inches across. Keep all the shroud lines straight and untangled.*

To drop supplies, a small, 12- to 30-inch-diameter parachute is attached to a container made of PVC pipe and endcaps. This procedure was never used in a "live" situation, but we practiced several dry runs in case the techniques were ever needed.

## PADRE'S PARTY TRICKS

The release mechanism comes in very handy for doing other fun things. I have successfully towed to altitude and released R/C gliders. On many other occasions, I have released a trailing 100-foot length of string or crepe-paper streamer for others to try to cut with their airplanes (a very difficult thing for the interceptor pilots to do). The remarkable virtue of such feats is the fact that if other planes become tangled in the towing string, or if the glider that's being towed gets

*(Continued on page 108)*



*Left: after the chute has been folded, loosely roll it up to prevent the lines from becoming tangled in the line attachment buttons. The chute body is wrapped in wax paper. Right: the packed chute is placed at or in front of the model's CG so that it won't affect the model's flight performance.*

HOW TO

*Smart looking, lightweight, durable*

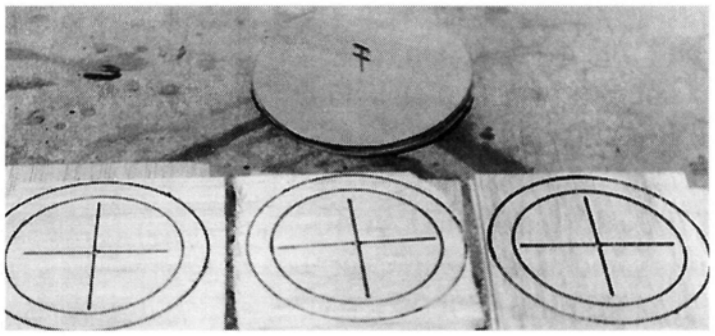
# Turn WW I Wheels on your Drill Press

by CLARKE SMILEY

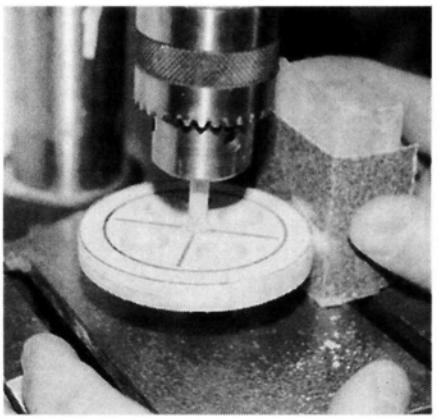
THERE ARE TIMES when building an airplane component from scratch is the only way to go. It may be that it costs less, the design has superior features, or you're just looking for an excuse to relax at the workbench. In this article, I discuss how to scratch-build light, strong, durable wheels for WW I-era aircraft—one of my chief interests in the hobby.

I use nothing out of the ordinary to make these wheels—just balsa, ply, ¼-inch dowels, aluminum tube stock, India ink, Coverite*, Bob Smith Industries* CA and surgical tubing. The size of the tubing you'll need depends on the size of the tires you'll be making, but a number of types can be used; the main requirement is that you must be able to bond the tubing with CA. I've had success with everything from fuel tubing to 2-inch garden hose. (If you're stumped in your search for tubing of the right size, try a good hardware or auto-supply store.)

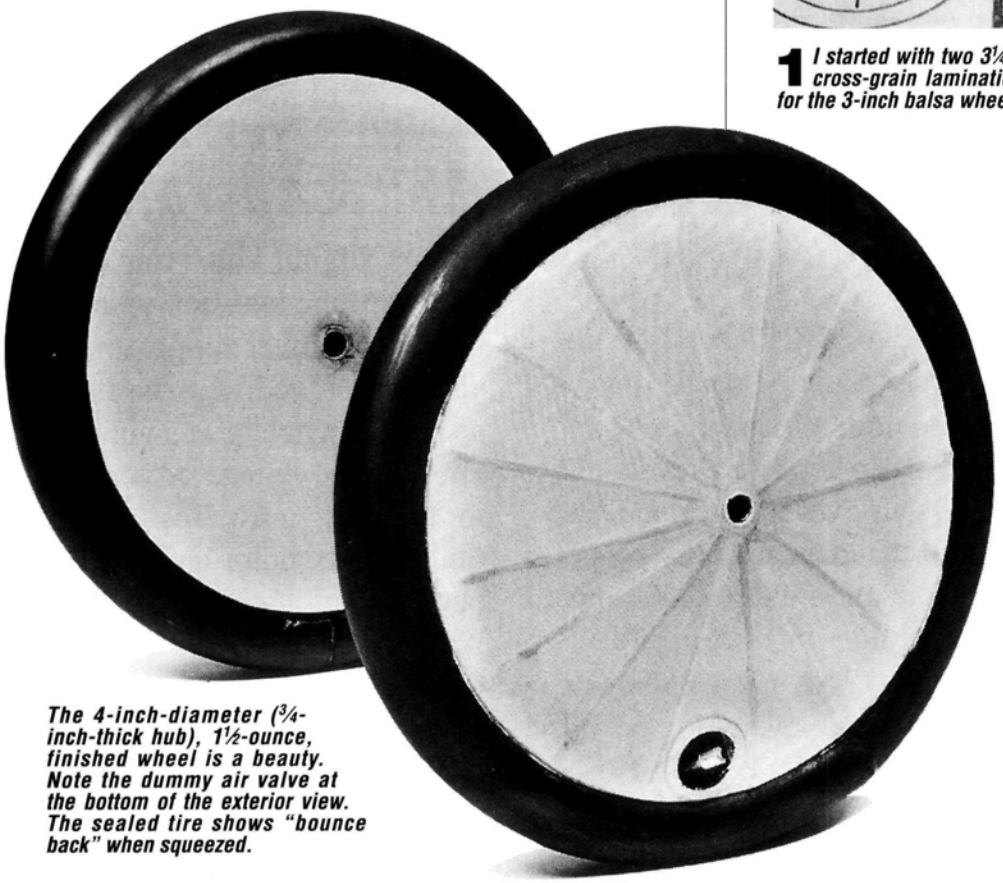
The photos and captions tell the rest of the story. Have fun showing off your own "home-grown" wheels at the flying field.



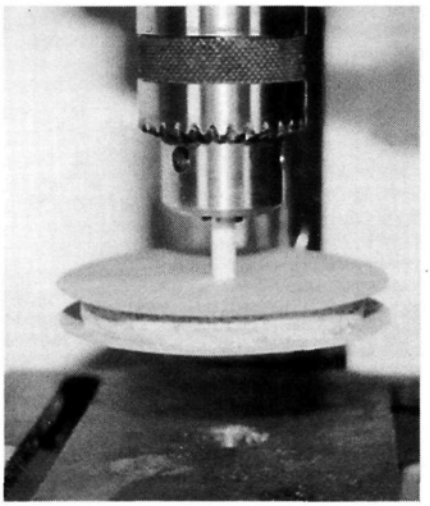
**1** *I started with two 3¼-inch-diameter, ¼-inch ply disks and three pairs of cross-grain laminations of 3/16-inch balsa sheet. I marked the patterns for the 3-inch balsa wheel centers on the cross-grain sheets.*



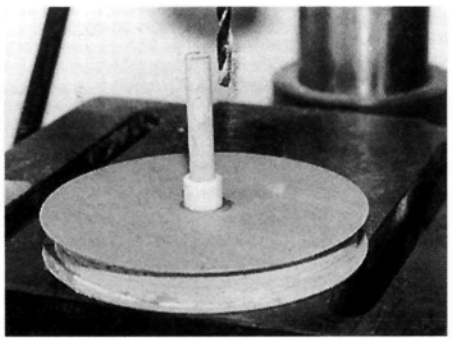
**2** *Cut out the circles of balsa (note that I also cut four lightening holes in the hub), and drill a ¼-inch hole through the balsa and ply disk centers. Next, cut some short lengths of ¼-inch dowel (one for each wheel). Use the drill press to true the balsa-dowel joint, and then CA the joint. Now you can true the wheels with sandpaper at slow speed on the drill press.*



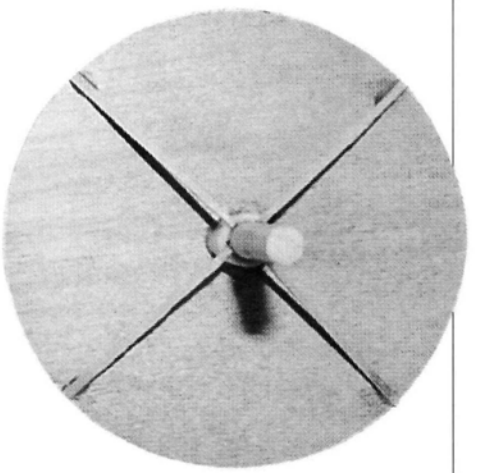
*The 4-inch-diameter (¾-inch-thick hub), 1½-ounce, finished wheel is a beauty. Note the dummy air valve at the bottom of the exterior view. The sealed tire shows "bounce back" when squeezed.*



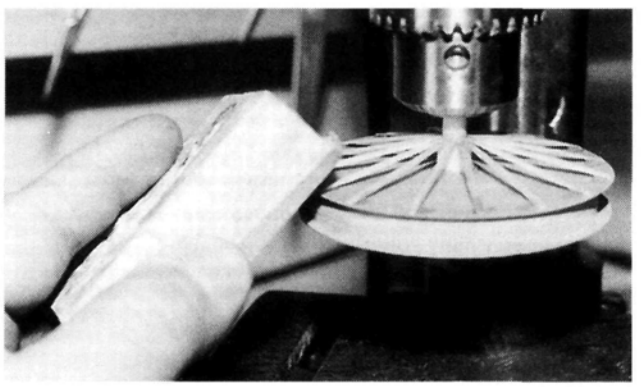
**3** *Remove the wheel from the drill press, and glue a 1/64-inch disk to each side; then re-chuck the wheel in the drill press. Use a sanding block to true the plywood disks.*



**4** *Wrap a 1/4-inch-wide, 6-inch-long piece of paper around the dowel, flush against the ply outer wall, and CA it in place. This wrapping forms a "shelf" for the next step.*

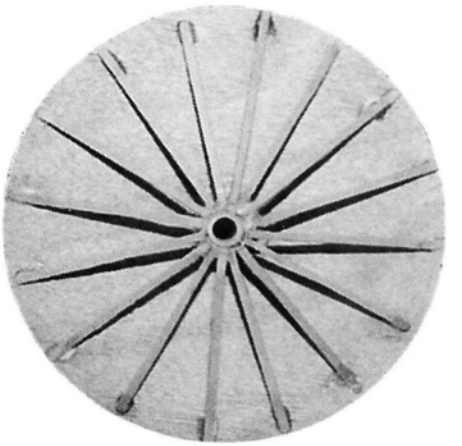


**5** *Use flat toothpicks to make the spokes. Here, I've glued four toothpicks to the wheel at 90 degrees to the dowel. The inboard ends of the toothpicks are canted up and rest on the edge of the paper wrapping.*

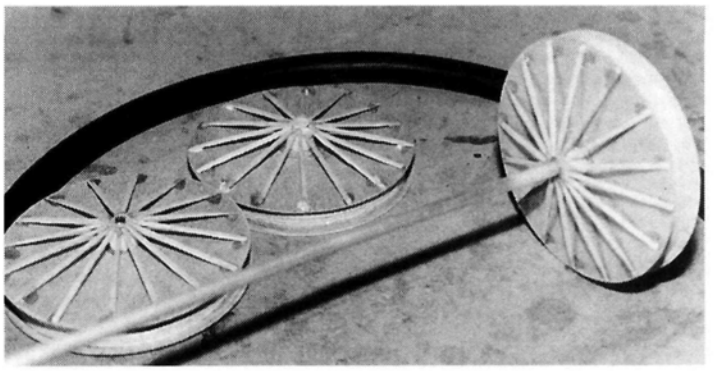


PHOTOS BY LARRY SMILEY

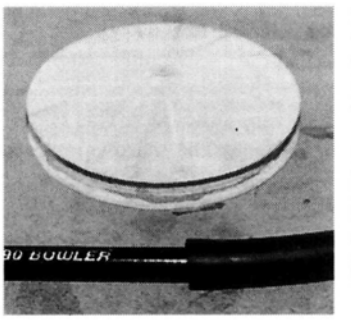
**6** *Glue a spoke between each of the four spokes already in place, thereby halving the distance between them. Then do this again, and you'll have 16 spokes divided by 16 equal spaces. Next, re-chuck the wheel in the drill press. Use a sanding block to feather the outside edges of the toothpick spokes. For best results, sand all spokes to the same length.*



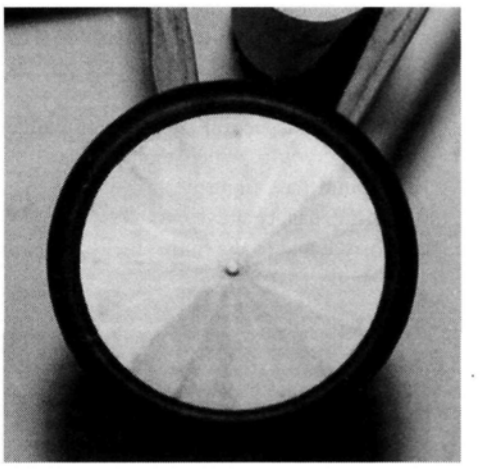
**7** *Cut the dowel flush with the top of the wrapping, and drill an axle hole in its center. This hole may be bushed with aluminum tubing.*



**8** *These wheels are now ready to be covered—before the "tubing" tire is installed.*




**9** *The wheel has been covered with Coverite on both sides. The excess has been ironed into the tire area. I made the tire out of surgical tubing that I blackened with India ink. Wrap the tubing around the wheel, and cut it so that it will be just a little tight when it's stretched around the wheel. The best way to cut the tubing square is to insert a dowel in it and roll the dowel under a sharp razor blade. Then CA the ends of the tubing together.*



**10** *Glue the tire to the rims with CA. To avoid shiny spots (from excess CA) on the outside face of the tire near the hub rim, apply the CA only to the inside of the inboard rim edge and to the rim floor. I later added an air valve to this wheel (see the opening photo) by insetting a small round piece of lite-ply (blackened with India ink) near the edge of the rim. A small piece of copper tube with a shorter piece of aluminum slid over its tip projects out of the inset ply piece at an angle and does a fairly good job of simulating an air valve.*

That's it! You're now set for the flying field. If you'd like to comment on this technique, drop me a line at 23 River Bend, Newmarket, NH 03857.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

PRODUCT REVIEW

# Astro Flight's FAI 25-5T and 40-5T Motors


by Tom Hunt

## Heavy horsepower for electric flight

ASTRO FLIGHT*, the manufacturer of high-power electric motors and other related hardware, has developed two new motors intended for 10-cell, F5B (formerly F3E), multi-task, electric-sailplane events. Designated FAI 25-5T and FAI 40-5T, these motors look like 25- to 40-size Astro motors, but to produce very high torque on only 10 cells, their design and construction have been changed significantly.

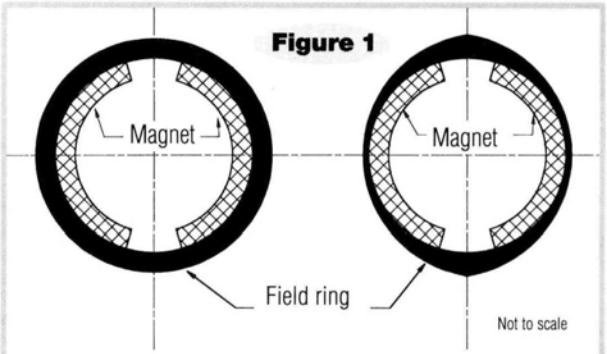
### EXTERNAL CHANGES

The first obvious external change is the use of an open endbell for better brush and armature cooling. (The new motors were designed to draw up to 70 amps for short durations.) This open-endbell design also saves weight.

On close inspection of the iron-magnet field ring, you'll notice that it isn't round (see Figure 1). The field ring has been asymmetrically machined to maximize the conductance of the magnetic field through the iron. Of all the changes, this machining saves the most weight in the new design.

Another external change is in the brushes and brush holders. This is the same as the hardware used in all other Astro motors, but the brush holders have been turned 90 degrees. Because Astro Flight brushes aren't square, putting the longer dimension tangential to the rotation direction increases dwell time, allowing more time for the brushes to commutate. This extends brush life, allows high-current draws without higher advanced timing and desensitizes timing effects.

**Figure 1**

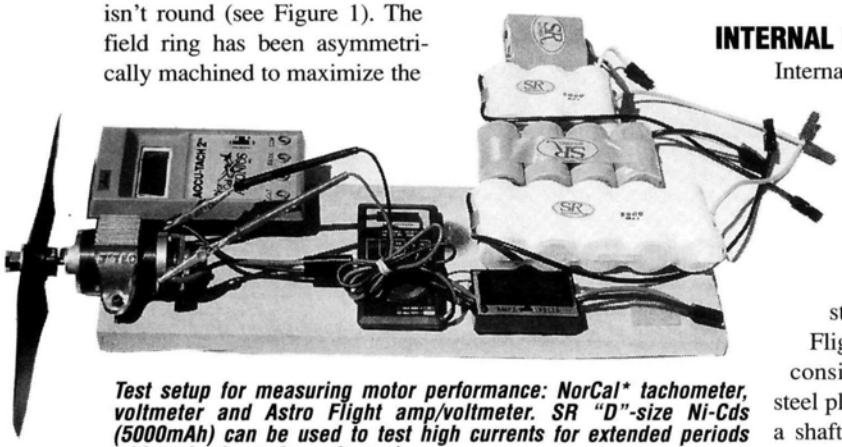



Typical magnet field ring | Astro FAI 25-5T and FAI 40-5T

### INTERNAL CHANGES

Internally, the motors feature the "tach stack" armature-machining process. Most electric motor armature construction (Astro Flight and others) consists of simple steel plates stacked on a shaft to the desired armature length. Wire of a specific gauge (for the desired torque) is then wound around each pole (segment) of the armature stack. The word "windings" refers to the size characteristics of the armature. The windings of the new Astro motors consist of five winds of 18-gauge wire around each of 11 segments of the armature.

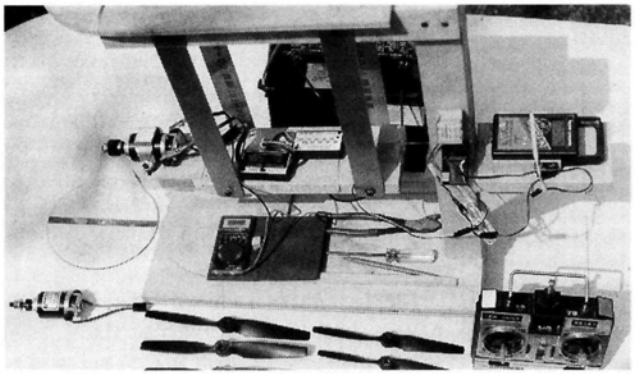
Most armature assemblies feel rough on the outside diameter of the stacked plates. Astro Flight goes one step further by turning this diameter smooth, improving balance and allowing higher rpm. The motors come with suitable prop adapters (5/16-24) and Astro Flight's no-loss connectors.



*Test setup for measuring motor performance: NorCal* tachometer, voltmeter and Astro Flight amp/voltmeter. SR "D"-size Ni-Cds (5000mAh) can be used to test high currents for extended periods without having to be recharged.*

### MOTOR TESTING

Thanks to my good friend Bob Kress (Kress Jets*), I was able to test these two motors for power and efficiency using a series of calibrated propellers. Bob tested half a dozen fiberglass-filled Taipan props to



*Test setup for measuring thrust and amp draw on various propellers: Normark* digital fish scale, Astro Flight amp/voltmeter and no. 205 speed controller, NorCal tachometer and 12V car battery for source voltage.*

**ASTRO 25 AND 40 TEST CHART**

**FAI 25-5T**

| Prop | Amps | Rpm | Thrust (oz.) | Volts |
|---|---|---|---|---|
| 10x5 Rev-Up | 54 | 11,800 | 54 | 10 |
| 9x5 Graupner | 50 | 11,700 | 49 | 10 |
| 10x5 Zinger | 54 | 11,600 | 53 | 10 |
| 8x5 Aero-naut | 31.5 | 14,500 | 32 | 10 |
| 9x6 APC | 47 | 12,100 | 49 | 10 |
| 9x5 MAP | 35 | 13,400 | 41 | 10 |

**FAI 40-5T**

| Prop | Amps | Rpm | Thrust (oz.) | Volts |
|---|---|---|---|---|
| 9x6 APC | 31.6 | 11,300 | 42 | 10 |
| 9x5 Graupner | 31.8 | 11,200 | 48 | 10 |
| 10x5 Rev-Up | 35 | 10,700 | 49 | 10 |
| 11x4 TFNYL | 45 | 9,900 | 61 | 10 |
| 11.5x7 MAP | 54 | 9,100 | 74 | 10 |
| 11x7 Graupner | 61 | 8,800 | 71 | 10 |
| 11.5x7 Aero-naut | 55 | 9,000 | 68 | 10 |

TFNYL—Top Flite Nylon
MAP—Model Airplane Products (France)

obtain the thrust constant (Kt) and power constant (Kp). Once these values are known for any prop, brake horsepower (b.hp) and thrust can be obtained by simply knowing the rpm. Here are the formulas:

- Brake horsepower = $Kp(rpm/10,000)^3$
- Thrust = $Kt(rpm/10,000)^2$

When you're dealing with electric motors, brake horsepower (b.hp) is better expressed as watts. The conversion is simple: b.hp x 746 = watts. This is the motor's output power. To find the input power (in watts), measure the input voltage (across the motor terminals), and multiply it by the current being applied to the motor. Knowing the input and output power, you can determine the motor's efficiency (percentage) using this formula: efficiency = input/output x 100.

The new Astro motors were first tested holding constant voltage and using the calibrated propellers to vary the "load" on the motors. Rpm and amperage were measured when 10 volts were applied to the motor. This data, once plotted, shows the best operating amperage for the applied voltage (see the graph in Figure 2). The FAI 25-5T's best efficiency is near 30 amps, and the FAI 40-5T's, nearer 40 amps.

The next test was to learn how well these motors behave with a varying voltage (as if you were throttling the motor in flight). For this test, only one prop was used per motor. The prop was chosen on the basis of drawing the maximum recommended current at full throttle. These results are shown in the graph in Figure 3. As you can see, these motors achieve their peak efficiency at very high current draws (30+ amps), but they do not experience large efficiency losses at 40 to 50 amps. The output of both of these motors approaches 0.4 to 0.5b.hp when they're appropriately "propped." Also important to note is that these motors would not make good "sport" motors, as efficiency is poor at lower sport amperage draws (20 amps or less).

Other motor characteristics were determined for those of you who need data to input into your electric model performance software. (See the specifications chart for a list of these values for both motors.) Programs that are set up to use these values include Electroflight Design* and AERO*COMP*. Both are powerful predic-

## SPECIFICATIONS

(as measured by author)

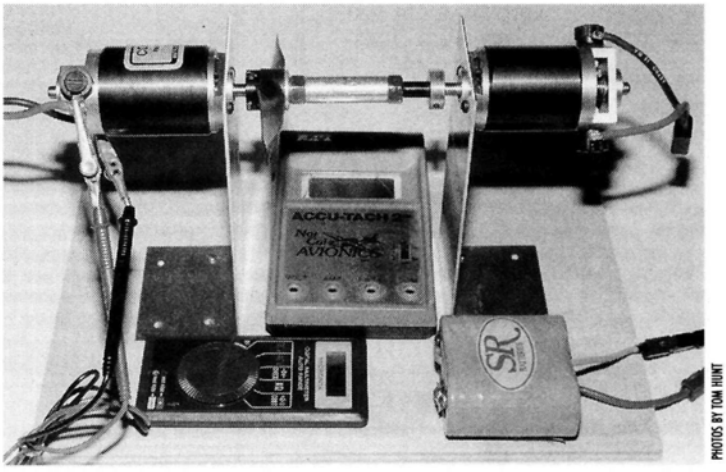
| | Astro FAI 25-5T | Astro FAI 40-5T |
|---|---|---|
| **Diameter** | 1.682 in. | 1.682 in. |
| **Length** (bearing to bearing) | 2.800 in. | 3.050 in. |
| **Width across brushes** | 2.335 in. | 2.340 in. |
| **Shaft size** (dia./length) | ¼x¾ in. | ¼x¾ in. |
| **Prop adapter thread** | 5/16 -24 | 5/16 -24 |
| **Weight** (w/prop adapter, connector) | 10.6 oz. | 12.5 oz |
| **Armature** | 5 turns, 18-ga. wire, 11 seg. | 5 turns, 18-ga. wire, 11 seg. |
| **Rpm/volt constant (Kv)** | | |
| —as received (advanced timing) | 1,550 | 1,200 |
| —0-deg. timing | 1,450 | 1,100 |
| **Armature resistance** | 0.044 ohm | 0.050 ohm |
| **No-load current (10 cells)** | | |
| —as received (advanced timing) | 8.0 amps | 9.0 amps |
| —0-deg. timing | 4.2 amps | 3.9 amps |
| **List price** | $199.95 | $219.95 |

**HITS**

- High-quality manufacturing
- High power output
- Efficient at high power
- Low-weight system

**MISSES**

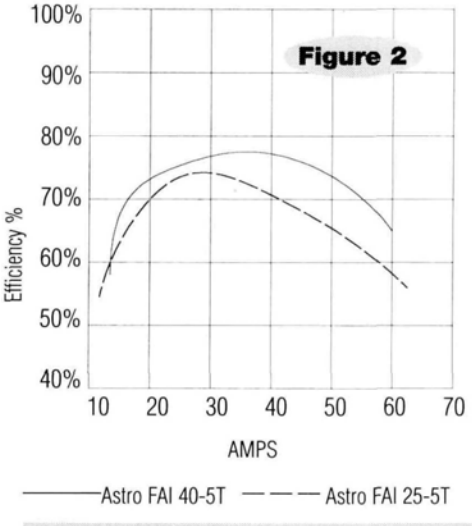
- Nothing to complain about




PHOTOS BY TOM HUNT

*Test setup for measuring Kv (rpm/volt constant). One motor "back-drives" the other to acquire rpm and voltage data. The prop was installed just to measure rpm.*

**MOTOR EFFICIENCY AT 10 VOLTS**




tors of electric-flight performance (AERO* COMP's latest version includes values for 116 motors).

• Rpm/volt constant, often called the "dynamo constant" (Kv), was obtained by using one motor to drive the other. The voltage across the driven motor was obtained, as was its rpm. Dividing the rpm value by the measured voltage gives you the Kv. Kv/1,355 = Kt, which is the torque constant of the motor (not to be confused with the Kt of the prop!).

• Armature resistance was obtained by applying a low voltage (two cells are usually enough) across a stalled motor and measuring the current and the voltage. Because no motion is involved, the resistance of the armature is simply V/I (volts/amps).

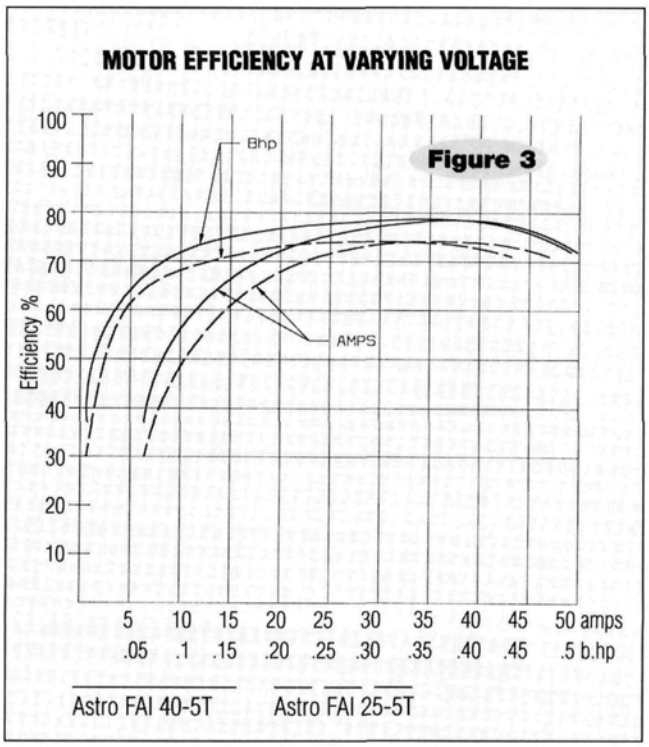
• No-load current is the simplest value to obtain. Apply to the motor a voltage proportionate to the number of cells intended for use on that motor (in this case, 10), and measure the current through the motor without a prop (or gearbox) installed.

The last tests examined how well these motors absorb power and create thrust, using some other off-the-shelf fixed and folding propellers. This data is tabulated for comparison (see the test chart). Only the props that I had at my disposal and that drew the intended current (near 50 amps) are listed.

## FLIGHT TESTING

Although both motors are intended for 10-cell F5B competition, I could not assess their value in this mode because no such events were held nearby. I did, however, fly both motors in my Aura 2, 27-cell, F5B ship (reviewed in *Model Airplane News*, April and May '94). The performance of the model at 61 ounces with the FAI 25-5T and an Aero-naut* 9.5x5 folder was good, but climb was even more spectacular at 63.5 ounces with the FAI 40-5T and a Model Airplane Products* (MAP) 11.5x7 prop. The extra 2.5 ounces came from the difference between the motors (see specifications) and from using a slightly heavier prop. This small extra weight did not seem to hurt the glide.

**MOTOR EFFICIENCY AT VARYING VOLTAGE**




## CONCLUSIONS

The data alone shows that these are powerful, efficient, high-torque competition motors. Their capability to swing big props on fewer cells at high currents and efficiency makes them highly desirable for any of the sprint electric-sailplane events. The physical size of these motors may not allow them to be retrofitted into some of the smaller, 10-cell ships on the market, but the power of these motors will make developing a bigger fuselage to accommodate them well worth the effort.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

# Webra 120 2-STROKE

## A new breed

by MIKE BILLINTON

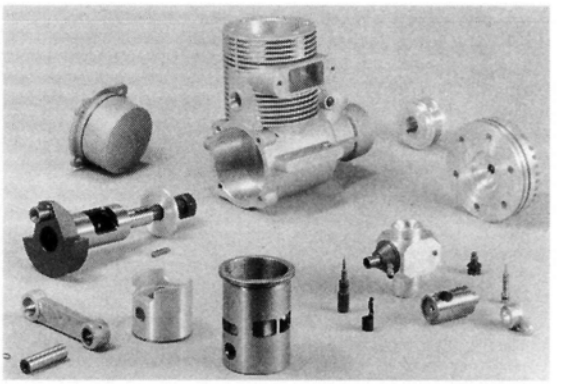
PHOTOS BY MIKE BILLINTON

*The Webra 120 could become a major player in F3A pattern competitions.*

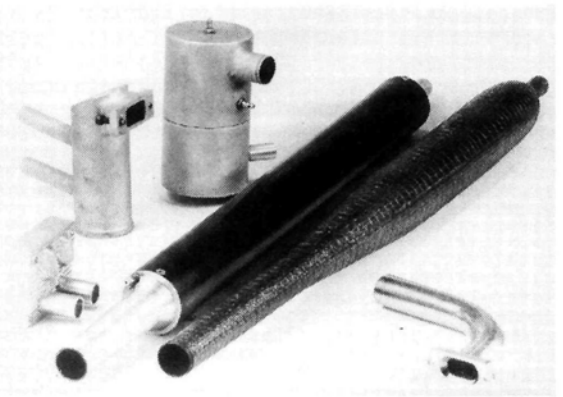
R/C COMPETITORS worldwide face exciting times. Following the FAI rule change that, from January 1996, will allow us an unrestricted choice of engine capacity, we'll have much wider scope for decision making.

As followers of the F3A aerobatics scene will know, for many years, FAI rules have specified an engine-capacity limit of 10cc (0.61ci), so this new position is a radical change. On the other hand, an increased awareness of our planes' noise has led the FAI to encourage the use of quieter 4-strokes with a specified maximum capacity of 20cc. (A capacity handicap was needed to bring the engines into the same performance area; the well-developed 2-stroke had already established quite an advantage over the 4-stroke.)

Intense technical progress and commercial considerations have pushed the 4-stroke to its current dominance in F3A competition. In fact, as far as engines go, F3A is almost a private battle between two 4-strokes—the YS 120 AC (air chamber) crankcase-charged and the O.S. FS120 Roots-supercharged. Without this "open door" offered by the FAI, the unique O.S. supercharged achievement might never have been realized.



*Foreground: Dykes-ring piston and well-finished hardened-steel liner. Disassembly starts with the removal of the wristpin through a hole in the rear of the case.*



*The pipes and mufflers used during the Webra 120 test. From left: J'Tec muffler; Slimline muffler; Webra "trash-can" muffler; Webra tuned pipe; Bolly carbon tuned pipe and Webra's steel exhaust manifold.*

The new FAI rulings will push to the forefront the current overall weight maximum of 11 pounds and a new wingspan maximum of 78.7 inches. These two constraints allow considerable freedom for designers to do as they will, and we're likely to see a greater variety of model designs. This represents a philosophical shift by the FAI, and the changes will no doubt appeal to individualists who feel restricted by too many rules. We may also hope that it will open the engine section to more manufacturers than we've recently seen under the current rules.

These rules changes will have more effect than most, and we're likely to see the 4-stroke lose its dominance. On grounds of costs, power-to-weight ratio and its supreme capability to harness power almost anywhere in the rpm band, after January 1996, the tuned-pipe 2-stroke will inevitably be the front-runner.

### WEBRA SPEED 120

Against this background, engines such as the Webra* Speed 120—the subject of this report—are significant. With a 20cc capacity, it should have potential, but of course, it will have to operate within the sound-level restrictions currently in use in F3A competitions.

Though, in open-exhaust form, the Webra 120 produces 7 percent less maximum torque than the Roots-supercharged O.S. FS120 4-stroke, when harnessed to a tuned pipe, it can outperform it. In the

4-stroke, the relatively fixed rpm point at which maximum torque occurs is a slight liability when compared with the "tunable" rpm point of the 2-stroke. The latter engine clearly has an edge when there's a need to go below 8,000rpm or so. It should be possible to extract some of the 2-stroke's "surplus" torque potential by using a longer pipe and going to even lower rpm (say, down to 6,500). This tuned-pipe 2-stroke would more easily stay within dB limits while benefiting from its high power-to-weight ratio.

Much of this is speculation based on my dyno-test results; experimentation and the realities of competition will soon reveal the truth. At this early stage, it's impossible to predict the displacement at which the 2-stroke, which is now looked upon with new favor, will be pitched—probably between 10cc and 25cc (0.61 to 1.8ci)—but if dB levels can be met, approximately 20cc (1.2ci) is a safe bet.

## MECHANICAL POINTS

• **The one-piece crankcase** offers great rigidity (a benefit that far outweighs any assembly problems). Because its relatively thin (1.5mm) hardened-steel liner has been "heat-shrink fit" into the crankcase, disassembly is only possible by withdrawing the wristpin through a screw-capped hole in the crankcase. This wristpin is threaded internally with a 4mm head bolt to facilitate removal. When this pin has been removed, the rest of the engine comes apart readily.

• **The standard Schnuerle porting** allows a sufficiently large blowdown period (between exhaust and transfer opening points) to guarantee a good tuned-pipe acoustics pulse. The medium-expansion aluminum-alloy piston has been set at a 0.004-inch cylinder-wall clearance and has a cast-iron, L-shaped, Dykes'-style piston ring set at its crown.

• **The standard, plug-in cylinder head** is fitted at a tight squish-band clearance of 0.020 inch and set up at a 7-degree angle; the final effective-compression ratio is quite high at 9.58:1 (considering the expectation of high tuned-pipe pressures).

# SPECIFICATIONS

**WEIGHTS & DIMENSIONS**

| | |
|---|---|
| **Capacity** | 1.228ci (20.139 in.) |
| **Bore** | 1.182 in. (30.03mm) |
| **Stroke** | 1.120 in. (28.448mm) |
| **Stroke/bore ratio** | 0.947:1 |
| **Timing periods** | Exhaust—149° |
| | Transfer—113° (angled up 4°) |
| | Boost—115° (angled up 45°) |
| | Front induction—Opens 41° ABDC |
| | —Closes 51° ATDC |
| | —Total period 190° |
| | —Blowdown 18° |
| **Combustion volume** | 1.65cc. |
| **Compression ratios** | Geometric 13.2:1 |
| | Effective 9.58:1 |
| **Exhaust port height** | 0.332 in. (8.44mm) |
| **Cylinder head squish** | 0.20 in. (0.05mm) |
| **Cylinder head squish angle** | 7° |
| **Squish-band width** | 0.177 in. (4.5mm) |
| **Carburetor bore** | 0.372 in. (9.47mm) |
| **Crankshaft diameter** | 0.787 in. (20mm) |
| **Crankshaft bore** | 0.514 in. (13.07mm) |
| **Crankpin diameter** | 0.334 in. (8.5mm) |
| **Crankshaft nose thread** | 8x1.25mm |
| **Wristpin diameter** | 0.295 in. (7.5mm) |
| **Connecting-rod centers** | 1.85 in. (47mm) |
| **Engine height** | 4.5 in. (114.4mm) |
| **Width** | 2.68 in. (68.17mm) |
| **Length** | 4.18 in. (1.06.1mm) |
| **Width between bearers** | 1.91 in. (48.5mm) |
| **Mounting-hole dimensions** | 2.20x1.18x0.170 in. (56x30x4.3mm) |
| **Exhaust-manifold bolt spacing** | 1.26 in. (32mm) |
| **Frontal area** | 9.11 sq. in. (bare) |
| **Weight** | 26.6 oz. (754g.), bare |
| **Crankshaft weight** | 5.35 oz. (152g) |
| **Piston weight** | 0.75 oz. (21g) |
| **Rod weight** | 0.45 oz. (13g) |

**PERFORMANCE**

**Max. b.hp**

3.20 @ 11,400rpm (Webra tuned pipe at standard length/5% nitro)
3.14 @ 12,700rpm (open exhaust/5% nitro)
2.71 @ 14,956rpm (Webra "trash-can" muffler/5% nitro)

**Max. torque**

370 oz.-in. @ 7,490rpm (Bolly EQ2000 pipe at 650mm/5% nitro)
283 oz.-in. @ 7,902rpm (open exhaust/5% nitro)
245 oz.-in. @ 6,745rpm ("trash-can" muffler/5% nitro)

**RPM ON STANDARD PROPS**

| | OPEN EXHAUST | W/"TRASH-CAN" MUFFLER | SLIMLINE MUFFLER | W/TUNED PIPE @ 610mm | BOLLY EQ 2000 T/PIPE @ 650mm |
|---|---|---|---|---|---|
| 20x10 Mastro | 4,748 | 4,576 | 4,710 | 4,875 | 5,407 |
| 24x8 Zinger | 4,903 | 4,420 | – | 4,615 | 5,258 |
| 20x8 Top Flite | 6,783 | 6,052 | 6,052 | 6,580 | 7,340 |
| 18x7 Mastro | 7,040 | 6,563 | – | 7,627 | 7,758 |
| 18x8 Merati | 7,251 | 6,497 | – | 7,489 | 7,754 |
| 20x6 Zinger | 7,350 | 6,907 | – | 7,930 | 8,010 |
| 16x12 APC | 8,012 | 7,474 | 7,474 | 8,680 | 8,370 |
| 14x14 APC | 8,560 | 7,810 | – | 9,139 | 8,700 |
| 15x8 Graupner | 10,150 | 9,261 | – | 10,484 | 9,866 |
| 15x8 APC | 10,360 | 9,569 | 9,966 | 10,484 | 10,145 |
| 18x10 3-BL Bolly carbon (see text) | | | | | |

**PERFORMANCE EQUIVALENTS**

| | | | | | |
|---|---|---|---|---|---|
| b.hp/ci | 2.56 | 2.20 | NOT | 2.60 | 2.26 |
| b.hp/cc | 0.156 | 0.135 | DYNO - | 0.159 | 0.139 |
| b.hp/lb. | 1.89 | 1.22 | TESTED | 1.37 | 1.30 |
| b.hp/kilo | 4.16 | 2.68 | – | 3.01 | 2.86 |
| oz.-in./ci | 230.00 | 199.50 | – | 280.90 | 301.30 |
| oz.-in./cc | 14.00 | 12.17 | – | 17.13 | 18.37 |
| oz.-in./lb. | 170.20 | 110.30 | – | 147.40 | 172.90 |
| Newton meter/cc | 0.100 | 0.087 | – | 0.122 | 0.13 |
| b.hp/sq. in. frontal area | 0.34 | 0.14 | – | 0.24 | 0.21 |

**Manufacturer Webra Modellmotoren, Eichengasse 572, A-2551 Enzesfeld, Austria.**
**U.S. distributor: Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign IL 61821; (217) 355-9511.**

• **The reciprocating/rotating parts** are definitely robust enough for their respective duties: crankshaft weight—5.35 ounces; piston—0.75 ounce; rod—0.45 ounce. Compare these with the O.S. 120 supercharged weights of 4.85 ounces for the crank and 0.45 ounce for its piston. For Webra, the unimportant consequence of these heavy internal parts is a relative restriction on high rpm: running above 15,000rpm becomes slightly ragged, though vibration is still reasonably low. At the intended design speeds—around 7,000 to 11,000rpm—there was little vibration (a subjective assessment).

• **The new, very robust Webra TN carburetor** seems to be bulletproof: solid, turned-aluminum body; short, rigid, O-ringed main and secondary fuel needles; and a solid turned-aluminum throttle arm.

## WEIGHT COMPARISONS

**YS FS120**, bare weight: 2.10 pounds.

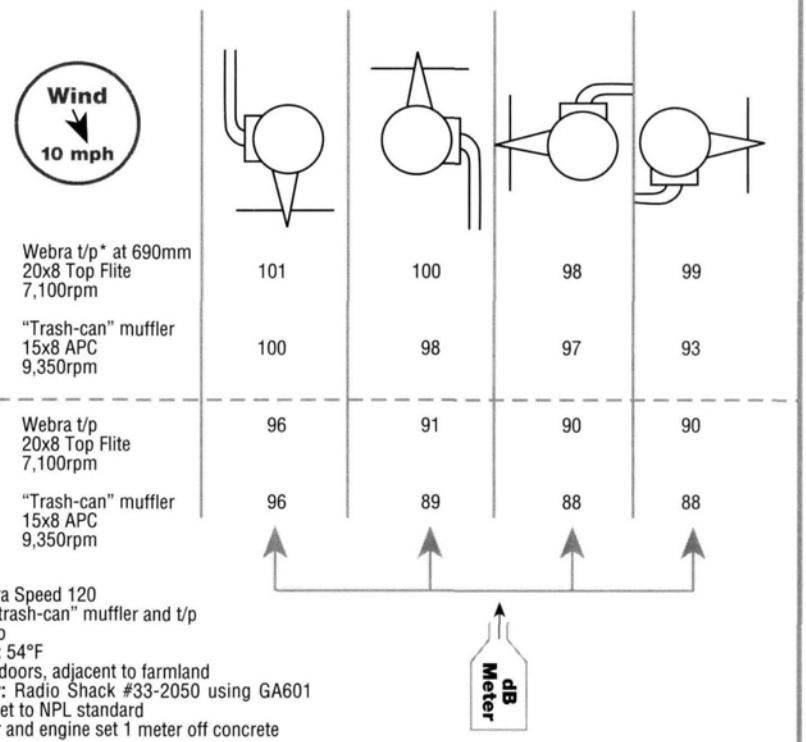
**O.S. FS120 supercharged** with small muffler: 2.37 pounds.

**Webra Speed 120** with Webra tuned pipe: 2.34 pounds.

—with Bolly EQ2000 tuned pipe: 2.14 pounds.

**Webra Speed 120** with Webra "trash-can" muffler: 2.22 pounds.

## WEBRA 120 dB LEVELS




**Engine:** Webra Speed 120
**Equipment:** "trash-can" muffler and t/p
**Fuel:** 5% nitro
**Temperature:** 54°F
**Location:** outdoors, adjacent to farmland
**Sound meter:** Radio Shack #33-2050 using GA601 calibrator set to NPL standard
**Height:** meter and engine set 1 meter off concrete

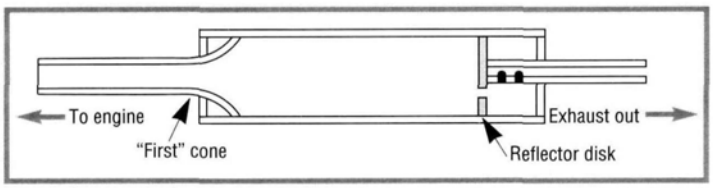
*t/p = tuned pipe

## PERFORMANCE

During early running in and subsequent rpm checks, I used a range of standard propellers. As always, the precise figures reached reflect not only the engine under scrutiny but also the crucial air-density values. With this type of engine test, the most accurate figures are the final, corrected horsepower values; atmospheric factors affect both torque values and propeller rpm. (See sidebar, "Compensating for Weather Changes.")

This four-day test saw a spread of correction factors from 1.0016 to 1.018. The latter figure implies that the engine was actually producing 98.2 percent of the power it would have produced had "standard conditions" existed. Each hp curve on the power graph is corrected to reflect the specific conditions at the time the reading was made.

Though the correction factors here are small, they just become large enough to mean that accurate conclusions can't be safely drawn from rpm checks alone. If you want to compare engines, you should measure actual torque (with correcting factors). It's a more accurate way of proceeding, because observations over the years have shown that rpm on given propellers vary enough to throw some doubt on the method's precision.




***Webra's unusual tuned-pipe design is common to both their LS61 "pattern" engine and the Speed 120. (Not to scale.)***

**Test 1. Open exhaust.** Five percent nitro, 10 percent castor and 10 percent ML70 synthetic oil; Rossi 6 spark plug.

Rpm ranged from just under 5,000 to 13,160, and peak hp appeared to have been reached, but I ended the test to conserve the engine for the tuned-pipe tests to come.

**Test 2. Webra "trash-can" muffler.** Fuel and plug as in Test 1.

The separately mounted, large-volume muffler was supplied by the manufacturer. When used with the Webra steel exhaust header and silicon connector, it can be mounted in a variety of positions, and the tests showed that it reduced torque, hp and fuel consumption in the usual way. But there was no sign of the expected rapid decline in torque at high rpm; in fact, some limited resonance effect probably contributed to the engine's ability to keep charging on up to 15,000rpm (not really a usable area, though).

Depending on the aircraft, the props to use are the 16x12 APC* (for a nice lazy 7,400rpm) and the faster 15x8 Graupner*.

**Test 3. Webra tuned pipe at standard length**—610mm from the piston face to the reflector disk. Fuel and plug as in Test 1.

The non-scale drawing shows the layout of this unusual newer pipe. It was designed by Webra for their 61 long-stroke and this 120 engine (both in the F3A arena), and it further questions our ideas on tuned-pipe geometry. This follows the dent made in twin-cone philosophy by the O.S. flat-plate, reflector-disk pipe fitted to the 46 VRM marine racing engine in 1980. This earlier pipe effectively eliminated the traditional rear convergent cone, and this new Webra pipe now throws out the standard front divergent cone and is considerably easier to manufacture.

The new Webra pipe features: a trumpet shape (a concave accelerating curve) at the front, instead of the usual straight-sided cone or shallow convex curve; and there's a very long parallel section between the trumpet and the rear reflector disk. This feature usually leads to a more flexible response and a wider rpm band of useful torque—

without the pronounced sharp power peak of the full twin-cone style. Whatever the theoretical advantages of the design, it certainly results in a pipe that needs no welding or turning/spinning to manufacture a long cone.

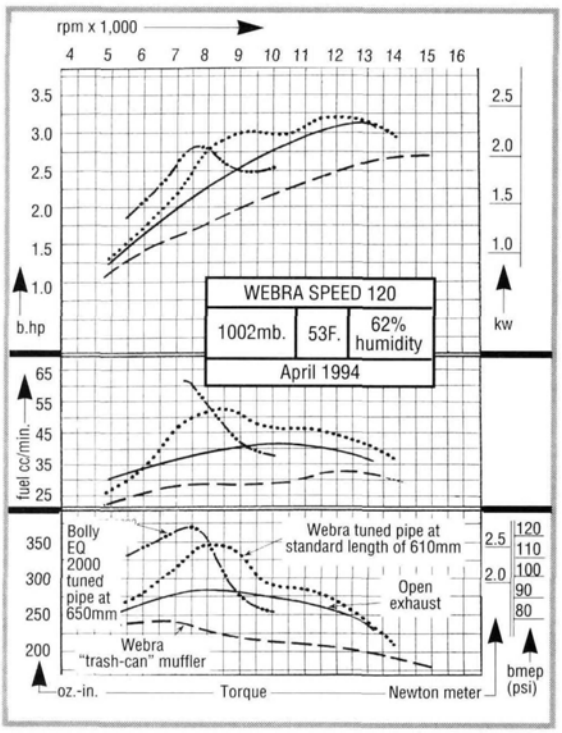
The F3A world competition class is a useful forcing ground for pipe designs that advance the vital cause of sound reduction. And new, simplified, pipe-construction methods might reduce the prices of tuned pipes in general (long overdue; some cost as much as some engines).

Using the Webra pipe at the provided length, maximum torque of 350 oz.-in. occurred at 8,300rpm, and the pipe's flexibility allowed horsepower to reach a maximum of 3.20 at 11,400rpm (see the performance graph, which has the captions on the torque curves). Excluding racing areas, much of today's model engine operation is nearer to the maximum torque points than, as of old, near the maximum b.hp points. Torque is the only force the engine develops anyway; hp is no more than an accumulation of that force over a distance and for a specific time. So, hp is a derived function, and when the time and distance elements are missing, there's no hp! The fictional "horse," striving to shift an unyielding mass is, if we accept James Watt's view, developing no useful power at all—the emphasis being on "useful." We'd surely feel the torque though! That *is* real!

**Test 4. Bolly EQ2000 carbon pipe**—set at 650mm. Same fuel and plug as in previous tests.

Bolly gives its pipe users a lot of information to help them determine the correct operating length to obtain a particular rpm figure. I've found their information very accurate; Bolly has done its homework. For this pipe, Bolly suggests 630mm for an rpm of 8,500. Not wishing to duplicate (probably) the Webra pipe's performance (time being at a premium), I aimed for less than 8,000rpm and chose a length of 650mm. This resulted in a large torque figure of 370 oz.-in. at 7,490rpm.

Both this and the Webra figures are storming results that put this engine/pipe setup well ahead of any available 4-stroker performance, whether hp/cubic inch, torque/cubic inch, or torque/weight ratios. (For reference, the performance equivalents shown all take account of the weights of the tuned pipes, mufflers, etc.) Keen observers will see that the Webra's mathematically calculated brake mean effective pressure figures (which may also be used to compare engines of all sizes) are unusually high; previous best figures have been at around 114psi for a tuned-pipe/low-nitro combination. Reaching 120psi has required the use of higher-nitro fuels and/or narrow-band, high-peak-power pipes.




**Test 5. Webra pipe**—at 690 mm. Same fuel and plug.

Both this result and that of Test 6 have been omitted from the graph to avoid confusion. The dyno results show maximum torque now appearing at approximately 7,000rpm as a result of the greater resonant length.

**Test 6. Bolly EQ2000 pipe**—at 680mm. Same fuel and plug.

Similarly, peak resonance here was pushed down to 6,900rpm. Subsequent attempts with both the Bolly and the Webra pipes to take the combinations further down the rpm band by increasing pipe length to around 730mm reduced torque levels in both cases—a clear indication that the lower limits had probably been established in Tests 5 and 6.

A last-minute arrival for the test was a beautifully constructed Bolly 18x10 three-blade carbon prop. This hefty load was felt to represent a possible marker for very low-rpm/low-noise-level operation for eventual F3A use.

Using the Bolly pipe at 680mm, I obtained 7,350rpm, and the Webra pipe at 690mm gave an almost identical result. Unfortunately, dB tests of this setup weren't possible at this time; I think more work is needed to ensure that engines of this size will be able to meet FAI limits. I had tested other combos during the preceding week and had seen how near the noise figures are to the mandated limits.

## SUMMARY

My Webra 120 results indicate that it might perhaps be a significant benchmark for the FAI competitions after January 1996. Clearly, there will be much experimentation before fliers settle on the best engine/prop/pipe compromise. The merits of this Webra are considerable; a final ability to reduce rpm to near 6,500 with effective tuned-pipe operation may be the key to its easy acceptance as a top-runner in competitions. In all other respects, the Webra is a clear thoroughbred and was virtually unscathed by the test sessions.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

## COMPENSATING FOR WEATHER CHANGES

Readers have asked me to repeat the reasons behind making compensations for changes in air density when evaluating engines. To explain:

- The greater the amount of air (oxygen) induced into the engine, the greater the amount of fuel that can be consumed with it—more power. Cold air is denser than hot air, so it contains more oxygen per cubic inch.
- Also high atmospheric pressure means that the air is more "compressed" and so contains more oxygen per cubic inch.
- Conversely, water vapor in the air (humidity) displaces a certain amount of oxygen, so it must reduce power.

Accurately testing and comparing internal-combustion engines involves taking atmospheric changes into account. Since "day one," my engine reports have always included details of the test-weather conditions, and the final hp results have, of course, incorporated the atmospheric correction factors.

At my U.K. test site, this factor is based on "standard weather" of 60 degrees Fahrenheit, 30 inches of barometric pressure and 60 percent relative humidity. Rarely does the weather here vary so much that the correction factor strays outside the range 0.994 to 1.06, and it's usually above 1.00. I multiply recorded torque readings by this figure to arrive at "corrected hp." It's fortunate that when I test an engine over two or three days, air density rarely changes so much that it requires a large correction-factor adjustment. When, during a test session, I see small changes, I calculate the mean weather figures and show them on the hp graph.

FIELD & BENCH REVIEW

# FOKKER D-VII

## A giant-scale bipe for the weekend dogfighter!

by GERRY YARRISH

TO EVEN the casual student of the Great War, the Fokker D-VII biplane is instantly recognizable. Flown by some of Germany's top aces and feared by Allied pilots, the D-VII's ruggedness, speed and agility made it a potent weapon in the German arsenal.

### THE KIT

Produced by Chuck Gill of The Aeroplane Works*, the kit includes all the wood and bent-wire parts for the 1/5-scale model that was designed by Rich Uravitch. All the wood in the kit is first class and matches the plans precisely. Every rib, former and sheet is hand-cut and sanded to the exact shape. The firewall is cut and beveled properly, and the fuselage sides and side doublers can be used as is without sanding.

Everything comes neatly packed in the box, and items such as the ribs and former parts are either bagged or rubber-banded together. The music-wire parts for the landing gear and the cabane struts are taped to a thick cardboard sheet to prevent them from moving around. All the parts in the kit are labeled. I especially like the fact that Chuck autographs each kit's firewall and includes the purchaser's name—a class act all the way around.

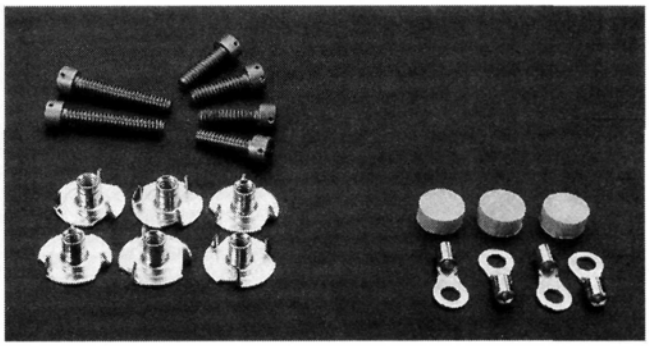
**Aeroplane Works/Uravitch**

## PLANS AND PLASTIC

In addition to the basic kit, you'll have to order the plans, the cowl and the two fuselage side panels from Rich Uravitch*. The clearly drawn plans consist of three sheets, the fuselage side view and horizontal stab, the wings and a pattern sheet that includes all the ribs, formers and other sheet parts. The plans also include instructions in a convenient check-off-as-you-go format. I followed the sequence that Rich laid out and had no trouble putting all the parts together. I did a few things differently, only because of personal building preferences. Though the model is big for a biplane, it was a joy to build and finish (and fly!).

## FUSELAGE CONSTRUCTION

I began by assembling all the separate lite-ply parts that make up the two main formers. Each former is made out of two layers of lite-ply with lap joints in each corner. The finished formers are ¼ inch thick, and they're very light and strong. The fuselage sides and side doublers have to be glued together, and the positions for the formers and the firewall have to be drawn on the inside surfaces. Since I used a Zenoah* G-38 gas engine to power the Fokker, I followed Rich's suggestion and added ⅜ inch of side thrust to the firewall.



*This hardware that comes with the kit includes blind nuts and aircraft-quality, steel cap screws for upper-wing attachment. The steel solder lugs are for the cabane attachment, and the three dowel pads are used for hard points to attach rigging wires to the vertical fin and the horizontal stab.*

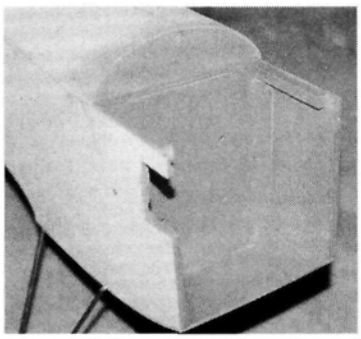
I pinned the fuselage sides to the plans and added the aft longerons and the vertical and diagonal braces. Lite-ply sheet parts are used to strengthen the tail end of the fuselage, and I glued these into place before removing the sides from the building board. I made sure that everything was square and straight; then I glued the formers into place on one side and added the other fuselage side. The firewall is then glued into place with 30-minute Hobby-Poxy*. I placed the fuselage so that it was vertical on the bench, installed the crosspieces, pulled the tail ends together and glued them.

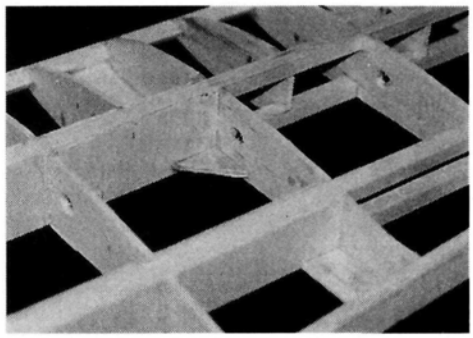
Adding the upper formers, the grooved strut attachment blocks, the lower-wing hold-down plate, the landing-gear blocks and the upper turtle-deck sheeting completed the fuselage. For strength, balsa tri-stock filler is added to each former and to the front and back of the firewall. I left off the lower front lite-ply sheeting until I had drilled the lower wing's attachment-dowel hole in former F-2. The horizontal stab and elevator halves, the rudder and the vertical-stab sheet parts are very easy to build, and they're covered and finished before they're attached to the fuselage.

## WING CONSTRUCTION

Both wings are of constant chord and thickness, and they're easy to build.

• **Top wing**. I started by pinning down and gluing together the two lower spars, the center-section sheeting, the ribs and the lower trailing-edge sheeting. I then added the two upper spars and glued the vertical-grain spar webbing to the fronts and backs of both sets of spars. I glued the leading edge into place, then installed half ribs between each of the full ribs for strength and appearance. The one-piece top wing is built flat on the bench.





*Above left: the recessed firewall can fit any size engine. The plans show the placement for the Zenoah G-38. Above right: the wings are made of balsa and have front and rear spars. Each spar has shear webbing added to the front and rear faces.*

I cut the ailerons out of the upper wing after everything had been glued together, marked the hinge line and cut vertically through each of the ribs. Then the ends of the ribs are cut back about ¼ inch, and the

## SPECIFICATIONS

**Name:** Fokker D-VII
**Manufacturer:** The Aeroplane Works
**Type:** Uravitch-designed, 1/5-size sport-scale biplane
**Price:** $250
**Wingspan:** 75 in. (upper), 68 in. (lower)
**Length:** 62 in.
**Wing area:** 1748 sq. in.
**Weight:** 17.25 lb.
**Wing loading:** 22.73 oz./sq. ft.
**Power req'd:** .90 to 1.08 2-stroke, 1.20 4-stroke, 2.2ci gasoline
**Engine used:** Zenoah G-38
**Prop used:** Zinger 18x8/14
**No. of channels req'd:** 4 (aileron, throttle, rudder, elevator)

**Features:** the kit includes all the wooden parts required to build the model. The ribs, former parts, sheet fin, vertical stab and elevators and firewall come cut and sanded to shape. All the wire parts for the elevator joiner, the cabane struts and the landing gear are bent to shape and taped to a cardboard sheet. The kit includes all the sheeting, hardwood blocks, plywood plates and stick materials to build a finished model. A bag of screws, cabane-attachment lugs, blind nuts and tail hard-point dowel pads are also included. The plans, plastic cowl and fuselage side plates are available from Rich Uravitch for $38.95 postage paid.

**Hits**
- Super flying characteristics.
- Top-quality wood and parts.
- Plans include step-by-step construction sequence.

**Misses**
- No hinges, control horns, pushrods or clevises are included, but most builders prefer to choose their own hardware anyway.

## FLIGHT PERFORMANCE

*The first flight of the D-VII took place on a sunny Saturday morning with absolutely no wind. The temperature was about 75 degrees, and the grass had just been mowed. The Zenoah G-38 is the upper end for engine size and power for the 17-pound bipe. Running on a 40:1 fuel mixture, the engine started after a few primes and a couple of flips of the propeller. No more excuses!*

### • Takeoff and landing

Ground handling with the non-steering tailskid was easier than I had expected, and tight turns can be performed with slight down-elevator to lift the tail. The large rudder has plenty of authority and easily counters engine torque.

With the Fokker at the end of the runway and the nose pointing directly into the almost nonexistent wind, I applied the throttle slowly and smoothly. At a little less than half throttle and only about 100 feet down the runway, the model effortlessly lifted off

the grass without any rotation, and it looked very scale-like. A slight back pressure on the stick and a touch of right had the Fokker tracking straight out for a picture-perfect departure. With the rest of the throttle pushed in, the nose set itself at a comfortable attitude, and the model gained altitude quickly.

On downwind, with the model directly across from me, I pulled back to one-quarter throttle and let the model start a shallow descent. I turned 90 degrees to crosswind without adding any back pressure on the stick and made another turn to set up for final approach about 25 feet high and 100 feet from the end of the runway. The model glides extremely well, and I floated right past the touchdown point. I added power and went around. I flew the second circuit a little farther out and, this time, I had about 10 feet of altitude as I reached the threshold. I chopped power to idle and gently flared to lose air speed. The model touched down in a three-point attitude, and the landing gear absorbed the shock without rebounding the plane back into the air. The D-VII rolled out straight and true with little demand on the rudder.

### • Slow-flight characteristics

Slowed down, the model needs a fair amount of nose-up attitude and additional throttle to fly straight and level, but it remains solid on the controls. Turns require more rudder than aileron, and power is required in turns to maintain altitude. The nose gets way up by the time you coax a stall out of all that wing area. When it does break, it's straight forward without either wingtip dropping off. On the approach, the nose must be kept level or slightly down because the model produces a lot of drag, and it's easy to get behind the power curve. With the nose set high and the power off, there's only one place to go—down!

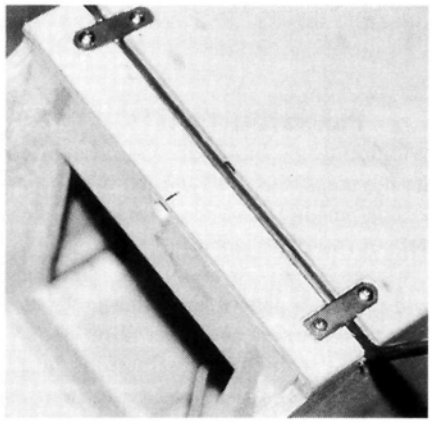
### • High-speed characteristics

Power on, this model is a homesick angel, and it will go up in a real hurry. With a wing loading of around 23 ounces per square foot, some down-trim is required for a straight and level high-speed run. Control is crisp, and pitch becomes slightly more sensitive. Roll response is good but cannot be considered fast. The rudder is very powerful at all speeds but, as speed increases, yaw-control sensitivity remains about the same. This may be because, at higher speeds, the model skids more with the input of rudder only, and the large fuselage set at an angle to the airflow blankets some of the rudder. Banked high and pulled around in very unscale-like pylon turns, the model tells you it isn't comfortable, but it never surprised me or snapped out of the turn.

### • Aerobatics

"Majestic" best describes how this model flies through its various maneuvers. Loops are large and slow and require about three-quarter throttle on the front half and one-quarter throttle for the trip down the backside. No dive is required for a clean loop, but power is required before the pitch change is asked for.

Rolls are barrel-like, and some rudder is required to tighten up the maneuver. Spins are a thing of beauty; after the power is pulled back and full up-elevator is in, a kick of right or left rudder almost snaps the plane inverted. When the nose drops, the spins start slowly, but it tightens up quickly after about two rotations. Recovery takes about 1½ turns without correction. Opposite rudder and aileron stops the spin in less than one turn. Hammerheads and wingovers are also very easy, but you have to throttle back coming down. This airplane is fun to fly, and it makes you look and feel like a hot pilot. Throttled back, it's undemanding, but opened up, it will tear up the sky in true WW I dogfighter fashion.



***The landing gear is made of music wire and is attached to the fuselage with steel straps screwed into hardwood blocks that are built into the fuselage.***

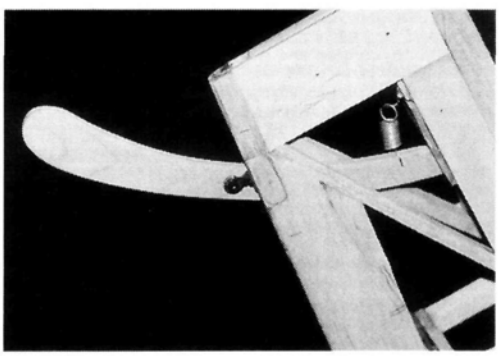
new trailing-edge cap is glued into place and sanded to match the ribs. The leading edges of the ailerons are also cut back, capped with ¼-inch-thick balsa and beveled so the surfaces can be top-hinged.

• **Bottom wing**. The bottom wing is easier to build, but it requires a dihedral angle. I built it in halves, then joined the panels and braced the wing with plywood dihedral joints that were epoxied to both the front and rear spars.

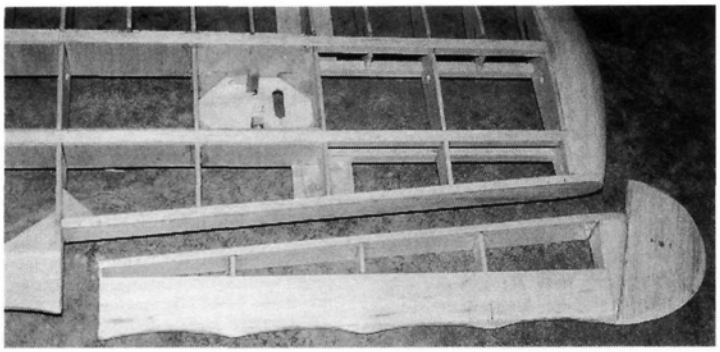
In keeping with the feel of this vintage air warrior, I decided to scallop the trailing edges of both wings. Before I installed the upper sheeting, I added strips of ½x⅛-inch-thick balsa to the trailing edges of both wings and sanded the strips even with the ribs. When I sanded in the scallops, there were no unsightly gaps between the upper and lower sheeting. Though the scallops add much to the look of the finished model, they are a real challenge to cover properly with iron-on cloth.

## STRUTS AND GEAR

The cabane struts and the landing gear are made of bent music wire. I joined the parts using Stay-Brite* silver solder and a small butane torch. I used thin steel wire to wrap the joints and applied liquid flux to the wire wrap. The ends of the struts terminate with wire lugs, which are bent at an angle to match the top wing's lower surface. I screwed the lugs to the



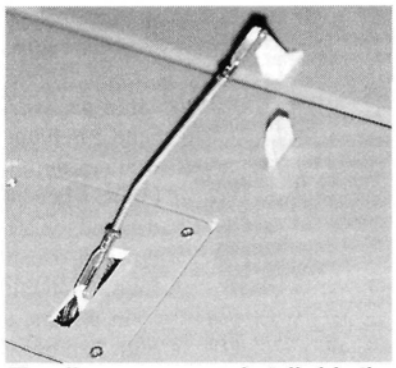
***The shock-absorbing tailskid pivots on a bolt and is spring-loaded at the top to keep it under tension.***



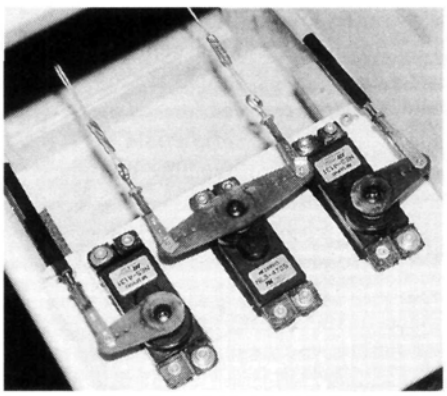
*After the wing has been built, the ailerons are cut out of the upper wing. The aileron servos are mounted in the wing on removable hatches that are flush with the wing's bottom surface.*

top wing with large sheet-metal screws and then slid the cabane struts into the wooden blocks built into the fuselage. The tops of the struts are then slipped into the lugs. I wrapped the wing's center section with several layers of aluminum foil to protect it from the heat of the torch when I soldered the lugs to the struts. I checked the wing's incidence with a Robart* Incidence Meter before I soldered the lugs to the struts, and I made sure that everything was accurately aligned *before* I applied the solder so that my plane would be straight and well-behaved.

The landing-gear wire, which is also wrapped and soldered together, is screwed to grooved hardwood blocks that are built into the bottom of the fuselage. The gear axles have small wire hooks to which rubber bands are attached. This helps to absorb landing shock and secures the gear's wing-shaped fairing. The fairing looks great on the finished model, and it's easy to build and install. Should a rubber band break, it's a simple task to use a length of wire to fish a new rubber band through the holes in the fairing.



*The aileron servos are installed in the upper wing. Four screws hold the hatch in place, and 4-40 hardware is used throughout.*



*The servo tray is installed just in front of former F-3. Two JR 4131 servos control the elevator (one for each half), and a pull/pull cable system that's attached to a 4735 controls the rudder.*

# Scourge of the Wartime Skies

**Designed by Fokker's top designer, Reinhold Platz, the D-VII was the winner of the 1918 single-seat fighter competition held at Johannisthal near Berlin, Germany. The D-VII took advantage of new construction technology that used welded steel tubes for the fuselage frame and a thick, cantilever wing with two massive box spars to produce a strong, rugged wing. Its large radiator and lack of rigging wires set the fighter apart from its contemporaries.**

**Powered by a 160, 180, or 220hp, liquid-cooled Mercedes engine, or a 185hp BMW engine, and armed with a pair of synchronized, forward-firing Spandau machine guns, the fighter was a powerful force. By the end of 1918, all German units stationed on the Western Front were equipped with the fighter. Many of Germany's top aces flew the D-VII, including Ernst Udet, Lothar von Richthofen, Theo Osterkamp and Rudolf Berthold. The fighter was so superior that it was the only aircraft mentioned in the Allied peace treaty. The treaty stipulated that Germany surrender all of its D-VII fighters.**

*Reinhold Platz*

## FINISHING

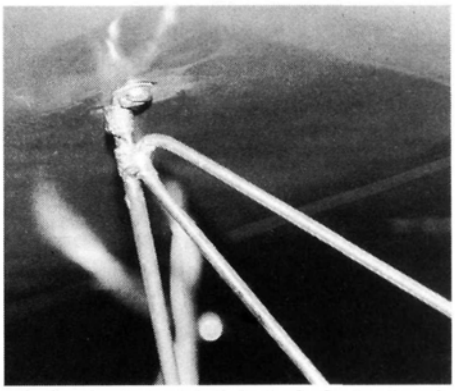
I finished the model with Coverite's* 21st Century light-red fabric. The cloth is easy to use if you read the directions and apply it at the proper temperature (about 250 degrees). The fabric adheres well and goes over curved surfaces easily. A second pass with the iron set at a higher temperature produces a drum-tight finish.

I cut out the German insignias and other markings from the covering fabric and ironed them on using a low temperature so they wouldn't shrink. Because air can escape through the cloth, no air bubbles will form.

The plastic cowl and the fuselage side plates were painted with Krylon metallic silver spray paint and then a coat of Krylon clear was added. I used acrylic craft paints for the pilot figure and Krylon flat black for the machine guns.

## FINAL ASSEMBLY

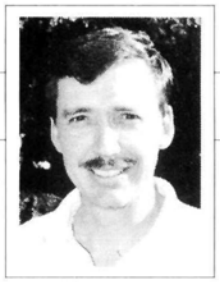
I made the N-struts out of 3/8-inch-diameter dowels (1/4-inch dowels were included in the kit, but the 3/8-inch dowels look better and are stronger), and I attached them to plywood tabs that projected from the upper and lower wings. The lower ends of the strut are attached to the tabs with simple wire Z-bends and, at the top, I used 4-40 clevises. I wrapped the joints with thin nylon thread and then soaked the thread



*The front cabane detail. A steel wire lug is soldered to the top of the cabane and bent to match the wing's lower surface. A sheet-metal screw secures the wing in place.*

*(Continued on page 99)*

# SIMPLE PROGRAMMING



DAVID C. BARON

## AIRTRONICS QUASAR

THE GOOD FOLKS at Airtronics* continue to show the R/C community just how simple and friendly a programmable radio can get. Their new 6-channel Quasar has three built-in model memories, and the transmitter is available in two types: a dedicated airplane version and a helicopter version. The radio is available only as an FM system, but this seems to be the trend with entry-level computer radios.


*The New Airtronics Quasar computer radio is well-thought-out and very easy to use and program. With this radio, you could lose the instruction manual and never miss it.*

### NOTEWORTHY FEATURES

This radio is totally interactive, i.e., you can instantly see the changes you make. To try this, hold the appropriate stick of the radio at full deflection while you set the programming to reverse the same channel. If you see the control surface go from one extreme to the other, you'll then be able to verify changes instantly as you make them. Some radios require you to save commands before you try them and may require that you even switch from the programming mode to the active mode. An interactive programming system is invaluable when it comes to quick setup and minimal frustration at having what you "expect to see happen" become reality.

With regard to the computer "brains" of this radio, Airtronics has a knack for innovation in its programming. The Quasar and its big brother, the 660, have systems that are clear and simple. As for the new Quasar, I'll repeat what I said about the 660: "After reading this radio's manual one time, you could lose it and never miss it or need it again."

The Quasar doesn't leave you guessing where to go for the next change you need, and it doesn't allow you to over-program it so that the radio starts to do things you don't intend. For example, on some radios, you can cross-program the functions, and suddenly, your aileron trim will become flap trim, or it will start working backward altogether! With nearly all the radios on the market, it's possible to get lost in the function scroll. This is especially frustrating because many of the abbreviations are short and unrecognizable. Think about the last time you punched away at the edit key, blindly looking for a function in the scroll. You weren't sure whether you had passed it, and you went around and around, endlessly searching.

All of the Quasar's functions are always visible on the screen, and the function you're using is highlighted by a flashing bar. The shortest route to get to the next function is always crystal clear.

The size of the displays in Airtronics' entire line of radios puts many other manufacturers to shame. The Quasar's display is approximately twice as large as that of any other entry-level radio in its class. For that matter, it's larger than the displays of radios that cost twice as much or more.

### FUNCTIONS

• **Throttle-to-elevator mixing (TH-EL).** This is a valuable feature that you won't find on many other radios—regardless of their price. This mix is extremely valuable on overpowered aircraft that tend to change trim (elevator) as a result of throttle changes; they usually climb when power is increased and descend too steeply when the power is dropped. This mix easily compensates for this condition.

In gliders, throttle control is used with camber control. The Quasar's throttle-to-elevator mixing feature lets the elevator trim automatically compensate and adjust when the flaps are raised and lowered for different lift conditions.

• **Throttle-to-rudder mixing (TH-RU).** This is another great feature for pilots who fly overpowered planes. Throttle-to-rudder mixing compensates for the engine's torque at various power settings. It also makes me wonder whether this radio could be programmed for a respectable helicopter configuration!

• **Aileron-to-rudder mixing (AL-RU).** This feature is popular for pilots who just can't convince their left hand to share in the flying and taxiing duties. It gives you a range of 1 to 100 percent rudder deflection coupled to the aileron control. If you think that your J-3 Cub needs this to be manageable, please read on and look twice at the differential mixing function (discussed later in this article).

• **FLAP 2.** There are actually three flap systems built into the Quasar, and they're all controlled by a three-way

PHOTOS BY WALTER SIDAS


*A unique feature of the Quasar radio is the key-lock switch. The display screen is used solely for programming, and there is no edit mode to enter to make changes. The key-lock switch is used to prevent accidental changes from being made while the radio is being handled.*

flap switch at the upper right of the transmitter. The first position of this switch is elevator/flap coupling (discussed later). The center position is Flap 1, which allows you to use the flap knob on the face of the radio. You can adjust the flaps incrementally in this position or pre-set the flap positions so that they automatically go to this value when you move the switch to the center. The third position is called Flap 2. It allows a further deflection of the flaps beyond the position used for Flap 1. This way, you can have three flap positions built into the flap switch. Neutral in the elevator-to-flap mixing function (see later in this article).

• **Flap-to-elevator mixing (FL-EL).** This enables you to compensate for the pitch changes induced when the flaps are lowered. You must fly your plane first to determine how much elevator trim it requires and in which direction. Once this value has been programmed, it greatly increases the usefulness of flaps.

• **Elevator-to-flap mixing (EL-FL).** This is for you hot-doggers who want to loop inside the length of your airplane. It couples the flaps to the elevator channel. When you apply up-elevator, you'll get a percentage of down flaps. Getting the most efficient amount of flaps requires some tinkering, but the results are worth the effort. I usually suggest that you first try using half the throw measured in the elevator. This system works best on planes that have strip ailerons and the flaperon function activated.

• **Sub-trim (S-TRM).** This is vital when you're using a radio with multiple model memories. Because the Quasar has three, get in the habit of using sub-trim. Always trim your plane critically so that the mechanical trims are centered, especially before you change memories. This way, when you change back to that memory after flying a different plane, you won't have to test-fly your model all over again.

• **Flaperon (FLAPRN).** This is great and has countless uses. Let me begin by saying that to improve the quality of control, you should always install a separate servo for each aileron (as long as space and weight aren't serious problems). Don't use a Y-harness; instead, simply plug one aileron servo into channel 2 and the other into channel 6. Now activate the flaperons function, and take advantage of one or more of these capabilities: flap functions 1 and 2, differential mixing and EL-FL mixing.

(As you can see, you've opened the door to a world of possibilities, and you're just starting to use only some of the wonderful systems built into your new radio.)

• **Spoilerons (SPOIRON).** This function is for glider enthusiasts who play with variable camber. It couples the ailerons to the flaperon function and moves them up and down with throttle-stick position to achieve various speed and lift configurations during flight. The ailerons still work normally throughout the motion of the spoilers (or flaps).

This function isn't suitable for fun-fly or sport models because it displaces your throttle-trim capability and moves it to the top of the throttle stick's throw.

• **Differential (DIFF).** This feature is golden for those who take the time to explore its uses. You can use it to eliminate all unwanted yaw during aileron turns. Ninety-nine percent of all planes need some differential, and the ones that need it most are those with lifting (asymmetrical) airfoils.


*The display screen is very user-friendly. The list of functions wraps around it and is always visible. Pressing the function-select buttons moves the cursor back and forth and highlights the selected function. You always know where you are in the program, and you can see the quickest way to the next function.*

Begin by adjusting differential throw in 10-percent increments. This means more upward deflection than downward in the aileron motion. If you're unsure whether you need a negative value or a positive value, put in 50 percent or more, and carefully watch the ailerons. Look to see whether you have more upward throw than downward throw. When you're sure that you're achieving response in the proper direction, go back to 10

percent of that value, and fly your plane around the field.

• **Model select (M-SEL).** If you aren't planning to go out and buy more flight packs, you can still use this function to experiment with various configurations on the same model. I fly the model conventionally with memory 1 and tinker with different configurations in memory 2. This way, I always have the basic system with which to compare flight-performance changes.

The rest of the functions are basic and have been thoroughly discussed in previous months. They are reversing (REV), end-point adjusting (EPA) and dual rates (D/R).

• **Key lock switch.** This prevents accidental function changes while the radio is in use.

### SO WHAT'S MISSING?

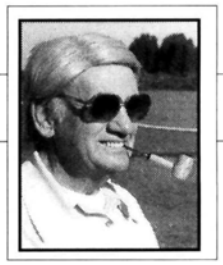
Every modeler has a favorite function that isn't found in every system. I suppose that if I were to add more functions to this radio, I would add an open program mix function, elevons and vee-tail. But hey, this is supposed to be a basic programmable radio, so it can't have everything. Yet I'm surprised that Airtronics chose throttle-to-rudder mixing over any of the above, which I consider to be basic in application.

### CONCLUSION

This radio gets the highest possible praise for its ease of programming and simple format. Second most impressive is its price; the Quasar should be available at a discount for around $270. Given Airtronics' reputation for quality and reliability, this radio should be a bestseller.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

# GOLDEN AGE OF R/C



HAL DeBOLT

## DESIGNING THE LIVE WIRE

THERE ARE TIMES when I wish that someone else was writing this column; it's hard to limit the personal views that creep in. But perhaps that's the price you pay for the privilege of having witnessed the evolution of this great modeling sport.

Let's look at the Live Wire (LW), the grandfather of today's trainer models. If you compare your trainer or "Sunday Sportster" with this old-time plane, the ancestry should be obvious. Although the LW's design may appear to be simplicity itself, it was the first of its kind. So, how did it come about?

*The original Live Wire Senior, powered by a K&B .19 engine and guided by a C-S 465 radio. It logged 124 flights before its escapement rudder froze during winter flying.*

### Details on Design

Former *Model Airplane News* editor Bill Winter and I worked together to develop these design objectives for a basic R/C model. Essentially, the model should:

1. Be capable of penetrating the wind.
2. Demonstrate flight that's "flat" with minimal climb tendency.
3. Hold altitude in turns.
4. Show minimal "ballooning" when turning into the wind.
5. Fly slowly to allow "thinking time."
6. Be capable of lifting heavy equipment.
7. Have enough room for R/C equipment.
8. Use equipment that can be transferred to other models.
9. Allow easy maintenance of R/C equipment.
10. Have a rugged structure that can withstand abuse.
11. Have a structure familiar to CL modelers (who were many at the time).
12. Have landing gear that protects the prop and allows easy field repair.

### WORKING OUT THE BUGS

In one afternoon of flying, my friend Tom Parry showed me that my dream of flying R/C planes could become a reality. His Berkely Aerotrol-equipped "Brigadeer" looked like something even this electronic dum-dum could work. To me, all R/C had been flabbergasting.

Very shortly, I managed to talk flying buddy George Swank into giving me his Aerotrol-equipped "Rudder Bug" he had "secretly" (we were all control-line fliers!) built, although he had failed to get the Aerotrol equipment to operate. Even to this uninitiated R/C'er, the problem was obvious: the rudder linkage was binding, and the poor little escapement couldn't move it.

So it was out to the field to set up the "dipole" transmitter antenna, which had to be rotated so that it always faced the model; you had to remember "range," which was in short supply for several years. George and I used the control-line circle "pylon" for the dipole pivot.

After some trials and tribulations, i.e., crashes, we began daily flying sessions in the evening, and we soon discovered that Tom's success with flying this design had been no accident. We flew in Buffalo, which isn't known as a windy city for naught, but by braving the wind, we learned what it takes to fly R/C aircraft in difficult conditions.

The "Bug" saw considerable flight time until, during one flight, as darkness set in, we lost sight of it. We found it the next morning, but the RK-61 tube had pooped out, and although we got a new one, we couldn't get it to work. (More extensive instructions surely would have helped!) Anyhow, we thought we had found what was needed for a competent R/C model.

I should note that most Dmeco kits and products originated as personal projects. At the time, control line was in its heyday, and Dmeco was a leading manufacturer. But, as history records, this

*Ivo Johnson of the Flying Bisons was a typical Sunday flier who had success with a Live Wire Senior using an O&R .24 engine and a C-S single-channel radio.*

personal thing drastically changed the company's course.

### REFINING R/C

Bill Winter is a cherished friend of mine, always ready to offer advice. He has been involved in R/C for several years, and as editor of *Model Airplane News,* he was in on the latest developments. What an opportunity for me!

Through phone calls and correspondence with Bill, I learned a great deal about R/C planes. I told him about my basic idea for the LW model. He found the concept so radical that it was hard to contemplate, but he said it could be the way to successful R/C flights. His advice was blunt: "DeBolt, you had better know what you're doing before you start." We collaborated on a long list of design objectives and then reduced it to the essentials. (See "Details on Design.")

The first four items deal with flight attitude—different from free flight. This was achieved by using a high-lift horizontal tail combined with a lift proportion, between the wing and the tail, that recognized changes in air speed; that way, the plane would maintain a flat flight attitude under all conditions.

Items 5 and 6 are related. Flying speed was kept slow by using low power and low-pitch props. Lift was accomplished by using the "fly on the wing" principle, setting large-area wing and tail elements at their maximum lift angles.

Items 7, 8 and 9 were accomplished by using a removable R/C unit (box) that was spacious enough to hold all the R/C equipment and could be easily transferred from one model to another. In those days, R/C equipment was precious, and mishaps were common, so many pilots had spare models.

Ten and 11 were no problem for an accomplished control-line flier. The "sheet and box" C/L style was simply adapted to meet R/C needs. We had expected weight to be a problem, but it wasn't.

Twelve was a nasty problem, but we solved it by using control-line-style aluminum gear attached with rubber bands. The gear simply flew off during the inevitable hard landings.

### THE LIVE WIRE COMES TO LIFE

As you can imagine, we had to make many corrections before we were satisfied. But would such a low-powered craft do the trick? Would it be too heavy? Would it fly as it had to?

We put together two LW kits, and prolific builder George Swank assembled his first. Given the RK-61 problem, we decided that the C-S 465 radio system would best suit our needs. Boy, did that prove to be the answer for non-electronic types!

*Former Model Airplane News editor and Live Wire design collaborator Bill Winter prepares his Senior for evaluation flights.*

We test-glided the LW off a nearby, 20-foot-high railroad embankment. You can imagine our jubilation when the first model left the launch in a steady glide that was long enough to allow us to get in a couple of rudder commands. Hey, man, let's try power! As it turned out, by that time, I had my LW ready, so mine made the first powered flight—a successful one.

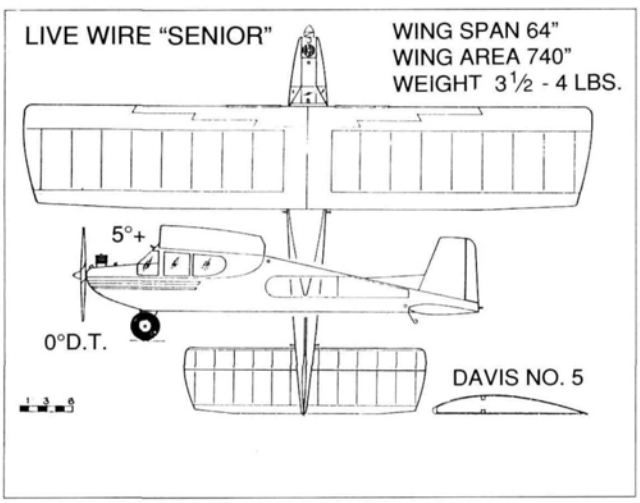
### SUCCESS AND SUCCESSORS

What followed was a period of euphoria; the LWs flew time after time with few shortcomings. We gladly reported to Bill that the "radical thing" worked as planned. We had become RC'ers!

Our efforts were rewarded when Swank and I took first and second places at the Canadian R/C Nationals and the Tangerine Internationals within a couple of months of that first flight. Obviously, the LW was a step in the right direction.

The LW concept was the foundation for the kit series that started many of us pilots on the road to R/C success. Above all, the plane offered great, exhilarating, fun-filled flights.

Live Wire "Senior" plans are available from Bill Weaver, P.O. Box 373, Middletown, MD 21769. ■




*Live Wire Senior three-view.*

Close races are typical in AT-6 competition. Here, Phil aVance's 26-pound Byron and Chuck Winter's 33-pound Byron battle it out in the Silver trophy race.

## FIRST ANNUAL GALVESTON

# Unlimited Ra

## *Racers in Texas break the 200mph barrier!*


Despite the weather and misunderstandings about the purse, everyone had a swell time at Galveston. Although the cash awards were on the skimpy side, a multitude of products were given away to help balance the purse.




The heat warped the right wing on Dick Sizer's Bryron Originals AT-6, and it snapped on the first takeoff. After repairs, the 25.5-pound Texan seemed to fly well, until Dick hit the ground after rounding pylon three in a heat race. The aircraft was later withdrawn from the race.

**BIG BIRD RACING took a giant step away from the West Coast to Galveston, TX, on May 10 to 15, 1994. Although the event was hampered by bad weather and organizational problems, Hi-G Promotions* and the city of Galveston did their best to roll out the red carpet for the racers. There will be another Galveston race next year.**

(Continued on page 78)

by
ROB WOOD

es


*Above: the new Thompson Trophy racing class introduced at Galveston this year should be popular. The Gilmore racer was built by Joe Pacey from Wendel Hostetler Plans*. Joe cut his own foam-cores to match the scale 7-percent airfoil. Powered by a G-62.*

*Left: a building error proved fatal when the stab spar of this 40-pound, scratch-built F1 Cosmic Wind failed during a test flight. The built-up balsa-and-ply aircraft was mistakenly outfitted with a stab spar made of balsa instead of the planned hardwood spar. The stab failed, and the aircraft dove straight into the ground.*

PHOTOS BY ROB WOOD

*Rob Pastor's face tells the story of Unlimited racing as he starts his Aerrow 200 in the Gold trophy race. Frank Tiano, holding on for dear life, took one look at "the kid's" flying ability and offered his sponsorship to this 19-year-old contender from California.*


*Kent McKenna's Aerrow 200-powered Lancair IV was the Unlimited Gold at Madera '93, but met the ground during qualifying at 200mph after rolling inverted at pylon 1.*


*This venerable Stiletto, flown by Chuck Collier, apparently suffered radio interference when a transmitter was inadvertently turned on, causing the model to crash onto the runway in Friday's first heat race.*

# INSIDE Cunningham's Winning Stiletto


*Bill Cunningham, entering the races at Galveston with three aircraft, came with high hopes after a crash in the first heat race at Madera '93 killed his chances for a 1993 trophy. Bill's Lancair IV turned the highest recorded radar speeds at Galveston (204mph) before a weak rear spar caused the wing to fail. He and Cliff Magee went on to take first place Gold with no. 888 (Stiletto) and no. 887 (Roto Finish). I interviewed Bill after the race.*

**Rob: Bill, sum up the week. How did it go?**

*Bill: I thought the week went really well. The main thing we were really happy about was our engines' performances. When we came down here, we knew the airplane was fast and were disappointed, of course, with the Lancair crash when we blew it apart, but the engines ran just about where we wanted 'em to—perfect every single flight. That was the biggest thrill: to build your own engine and have it run, flight after flight, and then to have our second teammate come in second place. Boy! We couldn't ask for any better! Except for the Lancair problem, everything else worked out.*

**Rob: Have you participated in other races?**

*Bill: We qualified fourth fastest at Madera last year, with a 7.3 Husqvarna single cylinder and, after going the single-cylinder route, we decided that it's really hard on airplanes. We crashed the airplane for unknown reasons. It just went into hold and crashed. We still have never figured out what happened. The radio system worked fine (of course) after the crash, but that airplane was basically the same airplane as the one we flew here, running the same prop [22x22].*

*Rob: Was that your first race?*

*Bill: Yeah, it was the first race I ever raced in. So, all I've flown in a race is one qualifying run and one turn of a heat race, and that was it. That was the end of our racing, and this is the first time we've flown through a full race.*

**Rob: Did you go full-bore into racing to develop some products, or was it just because you love racing?**

*Bill: Mainly, just because we like the racing. Bob got us into it.*

**Rob: Bob...?**

*Bill: Bob Ayres got us into it. He built the airplanes, I finished 'em out, and he and his brother Clark and the rest of us all did the engine work together because we knew we needed a twin. It was just a hobby deal, but the response to the engine has been so good that we're thinking about going ahead and making the engine available to everybody.*

**Rob: Great! Do you guys make your own spinners?**

*Bill: Yes, machined from aluminum bar stock.*

**Rob: Why did you decide on 8.8 inches for your twin?**

*Bill: We wanted to build a light airplane [33 pounds dry], and we wanted to be able to use the engine for TOC. It was one of the smallest engines out here, but the engine ran really well for us. It's a very light airplane. That's why we could really go around the turns a lot better than a lot of other airplanes—just the weight of it. I was able to turn a lot sharper, and the air speed was right up there with the top ones, but the corners really helped. If the airplane is too heavy, it just can't turn the turns.*

**Rob: What's your next race?**

*Bill: Probably Madera. We're gonna work on this airplane some more and work on a Lancair. This engine is still stock on the porting, so we've still got room for more power, and we're gonna work on that through the summer. The idle and transition are very reliable on the engine, and since 8.8 cubes is the maximum displacement for TOC, it's gonna work out for both.*

**Rob: Thanks for the interview, and good luck at Madera!**

## SPECIFICATIONS

**Weight:** 33 lb. (dry)
**Wing and stabs:** foam-core sheeted with 3/32-in. contest-grade balsa
**Wing spar:** doubled in center section.
**Engine:** 8.8c.i. A³ (see "New Gold-Class Engines" sidebar)
**Spinner:** A³, machined out of bar-stock aluminum
**Landing gear:** Robart* mains with gear doors (non-sequenced; no inner doors)
**Radio:** Futaba* PCM 1024ZAP
**Throttle:** one Futaba 9201 servo
**Ailerons:** one 9201 each
**Elevators:** two 9201s each half
**Rudder:** one 9303, metal-geared servo

*Bill Cunningham's winning model no. 888 started life as a D&W Aircraft* Stiletto fiberglass fuselage. The foam wing and stab cores were cut by the team. The full-length longerons, bulkheads, fuel-tank supports, servo tray, wing spar and firewall are made of 1/2-inch blue foam laminated on both sides with 5.7-ounce carbon-fiber cloth.*

# F1 Top Radar Speeds and Speed Comparisons

To eliminate false readings from the model's dive for the lead at the start of the race, all readings were taken on the downwind leg, during straight and level flight, on laps two through six. All speeds were taken from radar readings on the fastest airplane in each race.

*Fred French's scratch-built Cassut "Phugawi" (no. 17)—second place overall in F1.*

| Round no. | Heat no. | Airplane | Radar reading (mph) | Wind speed | Adjusted speed (mph) |
|---|---|---|---|---|---|
| 1 | 03 | no. 70 | 146 | 15mph tail | 131 |
| 1 | 106 | no. 333 | 146 | 12mph tail | 134 |
| 1 | 111 | no. 17 | 139 | 12mph tail | 127 |
| 2 | 204 | no. 60 | 154 | 17mph tail | 137 |
| 2 | 209 | no. 7 | 153 | 15mph tail | 138 |
| 3 | 48 | no. 31 | 154 | 14mph tail | 140 |
| 3 | 53 | no. 7 | 157 | 17mph tail | 140 |
| **TROPHY RACE** | | no. 7 | 134 | *12mph cross/ 6mph head | 140 |

*Trophy race comparison speeds: wind was cross, approx. 65 degrees at 12mph. I have added 6mph to each reading for adjusted speed.

| Class | Airplane | Radar reading (mph) | Wind speed | Adjusted speed (mph) |
|---|---|---|---|---|
| T-6 Bronze | no. 044 | 100 | 6mph head | 106 |
| T-6 Silver | no. 60 | 101 | 6mph head | 107 |
| T-6 Gold | no. 75 | 106 | 6mph head | 12 |
| UN Bronze | no. 47 | 174 | 6mph head | 180 |
| UN Silver | no. 06 | 135 | 6mph head | 141 |
| UN Gold | no. 888 | 177 | 6mph head | 183 |

Note: these speeds were recorded with a Stalker radar gun, and they were corrected for wind speed. (I also recorded the wind speed at the same time.)

The idea was sound: "If you build it, they will come." The promoters believed that a race held at a Texas resort town would attract more spectators and more teams from east of the Rockies. In addition, the attractions, beach and plentiful accommodations would entice racers from all parts of the country to bring their families, thus increasing the participation and benefits to everyone involved. The idea still has merit and should be investigated by any group hoping to pull off a successful event in the future.

*Dennis Crooks, long-time champion scale builder and pilot, took second-place Gold in the AT-6 class with his beautiful 25-pound Bridi fuselage and scratch-built-wing hybrid. Said Dennis, "Scale contests are great, but you don't get the rush you do in giant-scale racing!"*

Unfortunately, nature didn't cooperate and plagued the Houston/Galveston area with thunderstorms and tornadoes for the entire week. Although Galveston itself was spared the heavy rains suffered by the surrounding communities, the overall weather patterns kept the locals away, and spectator numbers were low. Nevertheless, the racers

# GEE BEE TALK

**Galveston gave us a glimpse of the new Thompson Trophy racing class. These beautiful racers should prove to be very popular. The famous Gee Bee racer is instantly recognizable; it's no wonder that Byron Originals decided to produce a kit.**

**Here's a short interview with Kenny Bryan—Byron Originals' designer, builder and test pilot.**

**Rob: Where did the idea for the model come from?**

***Bryan: Delmar Benjamin. He built a full-scale replica, and I watched it fly in 1992 at Oshkosh. I said right then and there, "I gotta have one!" So, I started working on one shortly thereafter, and that was the inspiration for the Gee Bee.***

**Rob: The construction of the wing is a little different from the normal Byron wing.**

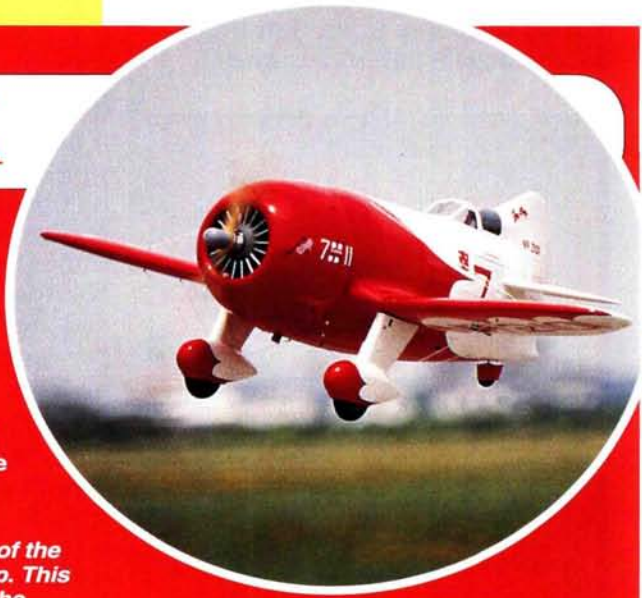
***Bryan: This particular airplane will have a balsa built-up wing, and I hope to have the parts laser-cut. The stab will be sheeted foam and, of course, the wheel pants and cowl will be fiberglass.***

**Rob: What made you decide to deviate from the typical Byron foam wing?**

***Bryan: The elliptical shape of the wing puts washout in the tip. This creates some problems in the molding process with parting lines. The build-up is a good, strong wing. It's lightweight, and I like scratch-building.***

**Rob: Does it have a G-62 in it?**

***Bryan: Yes, a G-62. It has the Purr Power exhaust system on it, but it's the same engine we raced in the T-6s at Madera.***



**Rob: Thanks, and good luck with the Gee Bee.**

## Qualifying Times

**AT-6**

| Pos. | Pilot/No. | Time (secs.) |
|---|---|---|
| 1. | Dennis Crooks/140 | 20.375 |
| 2. | Fred Burgdorf/75 | 20.815 |
| 3. | Fred French/17 | 20.970 |
| 4. | Gary Hover/27 | 21.175 |
| 5. | Scott Manning/88 | 22.285 |

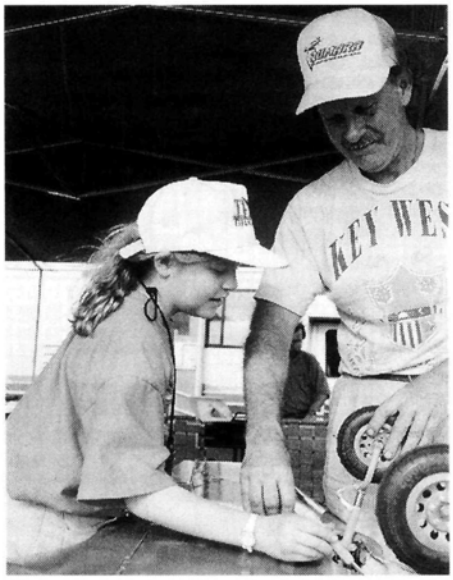
**UNLIMITED**

| | | |
|---|---|---|
| 1. | Bill Cunningham/888 | 15.190 |
| 2. | Dan Gray/196 | 15.830 |
| 3. | S. Whisman/33 | 15.985 |
| 4. | Rob Pastor/126 | 16.065 |
| 5. | Chip Hyde/26 | 16.140 |

went there to race, and race they did!

### NEW SPEED RECORDS SET

Speed was the major focus of attention at Galveston, especially since the prize for top Unlimited qualifier was a whopping $2,500! Bill Cunningham, flying a beautiful white and gold Stiletto, took that prize with a 15.19-second average lap time. The



*The youngest aircraft mechanic in the sport, Lacey Sizer, shows papa Dick how it's done.*

elusive 200mph speed limit was broken by several Unlimited aircraft at Galveston and, although the speeds were read by radar on the downwind leg, the readings were the highest recorded at any race held thus far.

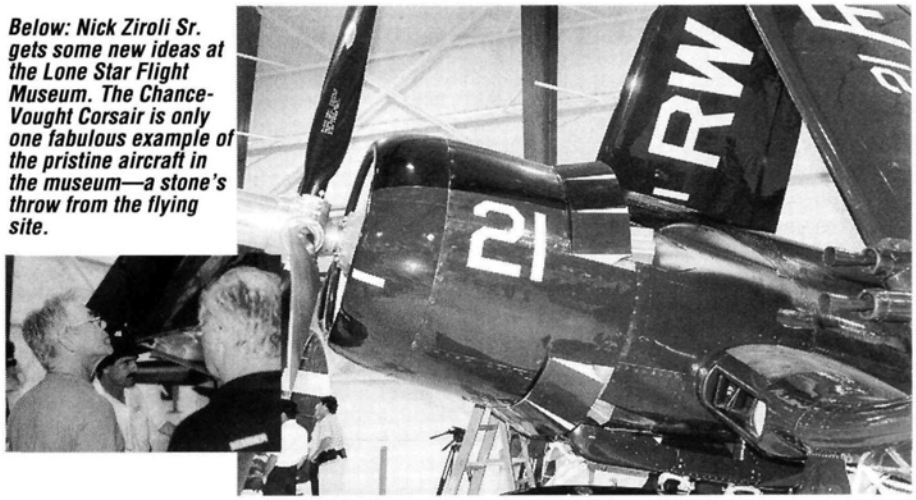
Interesting fact: every Unlimited aircraft passing the 200mph mark crashed while making a pylon turn! Kent McKenna's Madera '93 gold-winning Lancair IV ripped past the radar gun at 204mph before rolling over and diving into the ground on pylon 1. The cause of the crash is still undetermined. A second Lancair IV flown by Bill Cunningham (and equipped with his custom-built 8.8ci twin) also passed 200+mph before its rear spar failed and it, too, slammed into the ground. Another Unlimited—an Aerrow* 200-powered Stiletto flown by Bryan Keil of Classical Racing Team—also hit the magical number before elevator servo failure dumped the airplane into the mud at pylon 1.

A respectable number of Unlimited pilots flew at 190+mph in the heat races, including Stinger Wallace, who set a new record at 194mph for radar speed in a heat race, and Rob Pastor, who broke that record at 196mph less than 20 minutes later!

AT-6 qualifying was also fast and furious, owing in part to a $1,000 top-qualifier prize. Dennis Crooks, flying a hybrid Bridi* fuse and a scratch-built wing, took the top slot with an impressive 20.375-second lap time—a faster time than eight of the 23 Unlimited qualifiers!

Interesting note: nine Unlimiteds posted faster qualifying times at Galveston than the fastest time at Madera '91 (posted by John Krohn's Seafury with a 17.583-second lap time). Dennis Crooks, with his AT-6 Galveston qualifying time of 20.375

*Below: Nick Ziroli Sr. gets some new ideas at the Lone Star Flight Museum. The Chance-Vought Corsair is only one fabulous example of the pristine aircraft in the museum—a stone's throw from the flying site.*



*The Lone Star Flight Museum's Chance-Vought Corsair is one of only a few fully restored Corsairs that are flying today.*

*Barbecue, Texas-style! Several hundred people enjoyed the hospitality of Hi-G Promotions under the wings of this gorgeous B-25. All of the aircraft at the Lone Star Flight Museum can fly!*

# TOP RACERS

## UNLIMITED

| Pos. Gold | Team/pilot | Race no. | Aircraft/kit | Weight (wet) | Engine/disp. | Fuel | Radio | Prop | Prize |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A³//Bill Cunningham | 888 | Stiletto/D&W fuse | 36 lb. | A³/8.8ci | Methanol | Futaba | APC 22x22 | $3,800 |
| 2 | A³/Cliff Magee | 887 | RotoFinish/D&W | 39 lb. | A³/8.8ci | Methanol | Futaba | APC 22x22 | $750 |
| 3 | Aviation FX/Dan Gray | 196B | Stiletto/D&W | 40 lb. | Herbranson/217cc | Gas | Futaba | FX 22x30 | $625 |
| 4 | Pastor/Rob Pastor | 126 | Stiletto/Sky Aviation | 40 lb. | Aerrow/198cc | Gas | Futaba | APC 22x22 | $350 |
| 5 | 4-Stroke/Diego Lopez | 3 | Strega/K.T. Aviation* | 39 lb. | Vanleeuwen 4-stroke/100cc | Glow | Futaba | Zinger | $325 |
| **Silver** | | | | | | | | | |
| 1 | Rahm Racing/Randy Hill | 06 | P-51/Eaton | 41 lb. | Husky/7.3ci | Glow | JR | APC | $285 |
| 2 | Classical/Mike Boso | 184 | Stiletto/D&W fuse | 40 lb. | Webra/5.9ci | Methanol | JR | APC 22x18 | $265 |
| 3 | Braun/Ron Goodrich | 820 | P-51/Ziroli | 36 lb. | Prec. Eagle*/8.4ci | Byron | Futaba | APC 24x18 | $245 |
| 4 | Pasztor/Joe Pasztor Jr. | 66 | P-51/Nosen* | 32 lb. | Husky/6ci | Gas | JR | APC 22x14 | $225 |
| 5 | Desert Aircraft*/Dave Johnson | 29 | Stiletto/Desert Aircraft. | 33 lb. | 3W*/112cc | Gas | Airtronics | Custom | $205 |
| **Bronze** | | | | | | | | | |
| 1 | RWR/Stinger Wallace | 47 | Stiletto/D&W | 47 lb. | Aerrow/198 cc | Gas | JR | Zinger | $165 |
| 2 | RWR/Dave Smith | 99 | Stiletto/Sky Aviation | 45 lb. | Aerrow/198cc | Gas | JR | Custom | $155 |
| 3 | Brown Boys/Chuck Brown | 15 | Stiletto/scratch | 38 lb. | 3W/112 cc | Powermaster | Futaba | Bolly 20x20 | $145 |
| 4 | Braun/Ralph Braun | 68 | Stiletto/Ziroli | 34 lb. | King twin/6.4ci | Byron | Airtronics | APC 22x18 | $135 |
| 5 | Houston Air Race | 74 | Vendetta/scratch | 38 lb. | Aerrow/198cc | Gas | — | Tom Street | $125 |

## AT-6 RESULTS

| Gold Pos. | Team/pilot | Race no. | Kit | Weight | Radio | Prize |
|---|---|---|---|---|---|---|
| 1 | Race Pro/Fred Burgdorf | 75 | Race Pro | 25 lb. | Futaba | $800 |
| 2 | Crooks/Dennis Crooks | 140 | Bridi fuse | 25 lb. | Futaba | $600 |
| 3 | French/Fred French | 17 | Byron | 26.6 lb. | Futaba | $500 |
| 4 | Race Pro/Joe Marine | 333 | Race Pro | 25 lb. | Airtronics | $280 |
| 5 | Miller-Krohn/Scott Manning | 88 | Bridi | 25 lb. | Futaba | $260 |
| **Silver** | | | | | | |
| 1 | Team Wings/David Hendon | 177 | Byron | 25 lb. | JR | $228 |
| 2 | Merced Flyers/Chuck Winter | 60 | Byron | 32 lb. | Futaba | $212 |
| 3 | Braun/Ralph Braun | 68 | Ziroli | 25 lb. | Airtronics | $196 |
| 4 | Lonestar/Phil Vance | 181 | Byron | 26 lb. | — | $180 |
| 5 | Team Limited/Dave Marquis | 043 | Byron | 26 lb. | Futaba | $164 |
| **Bronze** | | | | | | |
| 1 | Team Limited/Kerry Stanley | 044 | 26 lb. | Byron | Futaba | $132 |
| 2 | R/C Hobby/Jim Rose | 54 | 27 lb. | Byron | JR | $124 |
| 3 | Braun/Ron Goodrich | 11G | 26 lb. | Ziroli | — | $116 |
| 4 | Independents/Michael Bruno | 55 | 26.5 lb. | Byron | Futaba | $108 |
| 5 | Rahm Racing/Walter McKee | 295 | 27.5 lb. | Ziroli plans | Ace | $100 |

*Note: all fuel provided; all engines Zenoah G-62s; all props (APC 22x10) provided.

***Dick Sizer's Byron AT-6 Texan flies once again after being repaired. Unfortunately, another crash put Dick out of the running.***

## FORMULA ONE

| Pos. | Team/pilot | Race no. | Aircraft/kit | Weight | Engine/disp. | Fuel | Radio | Prop | Prize |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Caveman/Richard Oliver | 7 | Ole Tiger/Ziroli plans | 23 lb. | Monster Motors/5.7ci | Methanol | JR | Bolly | $850 |
| 2 | Phugawi/Fred French | 17 | Cassut/own design | 29.5 lb. | Husky/6.0ci | Ritch's | Futaba | APC | $600 |
| 3 | Braun/Larry Skiles | 60 | Ole Tiger/Ziroli plans | 34 lb. | Quadra/100cc | Gas | Futaba | 20X18 | $500 |
| 4 | Caveman/A.J. Centineo | 31 | Ole Tiger/Ziroli Plans | 28 lb. | Centermark/6.0ci | Gas | — | 19x18 | $300 |
| 5 | ISC, Indy/Jim Goad Sr. | 068 | Ole Tiger/Ziroli plans | 31 lb. | Tartan 4-cycle/5.3ci | Methanol | Airtronics | APC | $250 |

## OTHER TROPHY RACE STATISTICS

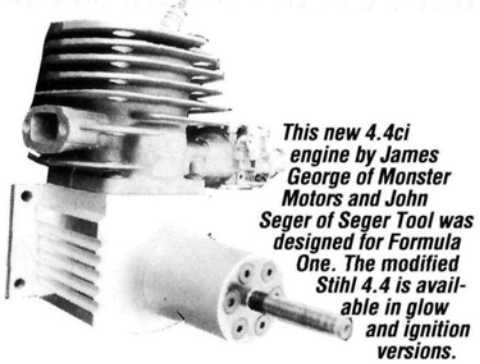
### SPINNERS

| Brand | Quan. | Brand | Quan. | Brand | Quan. |
|---|---|---|---|---|---|
| **UNLIMITED** | | **AT-6** | | **FORMULA ONE** | |
| TRU-TURN* | 11 | TRU-TURN | 13 | TRU-TURN | ALL |
| A³ | 2 | BARTON | 1 | | |
| FX | 1 | CB ASSOCIATES* | 1 | | |
| ZINGER* | 1 | | | | |

### LANDING GEAR

| Brand | Quan. | Brand | Quan. |
|---|---|---|---|
| **UNLIMITED** | | **AT-6** | |
| ROBART | 13 | ROBART | 14 |
| LIKES LINE* | 1 | CENTURY JET | 1 |
| CUSTOM ELECTRIC | 1 | | |

Note: in addition to the cash prizes, all trophy winners received contingency prizes in the form of products ranging from glue assortments to kits and radios. Byron paid cash contingency awards to all trophy winners in the AT-6 class who used Byron Originals kits.

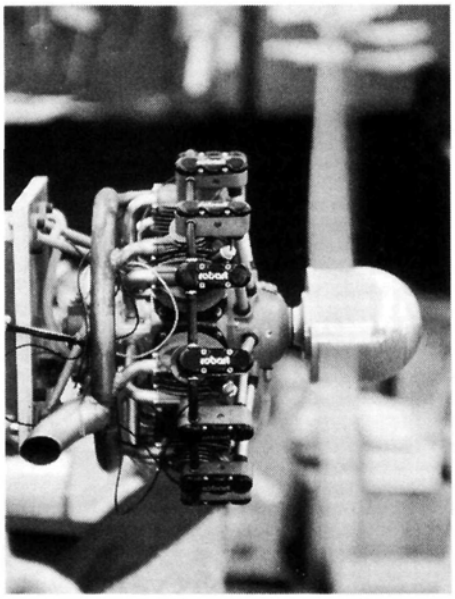


***This new 4.4ci engine by James George of Monster Motors and John Seger of Seger Tool was designed for Formula One. The modified Stihl 4.4 is available in glow and ignition versions.***

seconds average lap time, would have placed in fifth qualifying position in the Unlimited class at Madera '91!

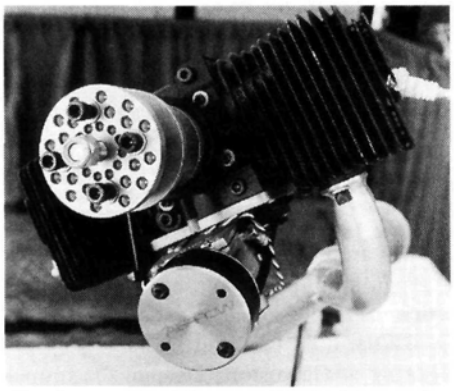
### FORMULA ONE

Giant-scale Formula One racing made its debut at Galveston. The rules call for a 42-percent-scale airframe with a clear canopy, pilot, basic instrument panel and a minimum weight of 25 pounds, with tuned-piped exhaust disallowed. Since Formula One rules have not yet been adopted by the Giant Scale Air Racing Association (GSARA*), Galveston rules differed from this year's Madera rules. The differences are that Galveston allowed a 10-percent minimum airfoil thickness and a maximum engine displacement of 6ci, while Madera specs limit the airfoil thickness to a minimum of 13 percent and allow a maximum



***The powerful 7-cylinder Robart radial has yet to race, but Tommy Walker says Robart has built a Tigercat for two of these awesome engines. The Tigercat should be ready for Madera '94.***

engine displacement of 4.6ci. Both Galveston and Madera promoters want the F1 class speeds to fall between AT-6 and Unlimited speeds. David Bridi, president of GSARA, fears that the Galveston specs will eventually produce F1 speeds rivaling those of the Unlimiteds, while the Texas group fears that the Madera specs would hold the F1 speeds below those of the AT-6 class. Until then, we have only the



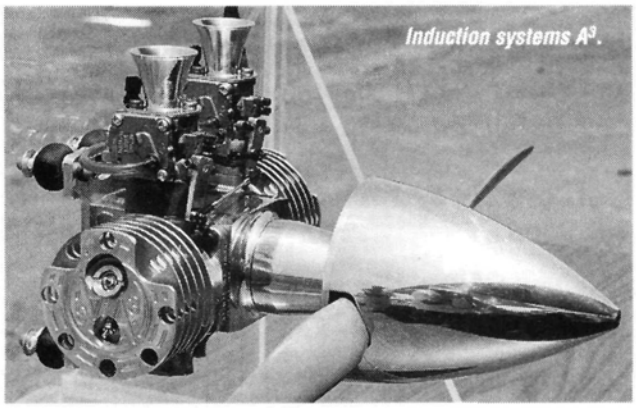
***The Aerrow 200 198cc gasoline/ignition engine is still the one to beat. This popular Canadian twin has won more races than any other engine.***

Galveston results with which to ponder the issue.

One amazing turn of events was that all four aircraft that raced in the very first giant-scale Formula One heat crashed! The first casualty occurred when Ron Hesskamp, flying no. 85, flew through a pylon early in the race. Next, Duke Crow (no. 70) and Mel Santmyers (no. 24), each flying a gorgeous Cosmic Wind, demonstrated the inability of two objects to occupy the same space at the same time, and down

## New gold-class engines

Aside from the Aerrows, 3Ws, Stihls, Husqvarnas, Power Bees and one-of-a-kind engines familiar to followers of giant-scale racing, two engines not seen in previous competitions made serious bids for the gold at Galveston. The first—a twin-cylinder, 217cc engine known as the Dyad 217R—was originally designed by Herbranson Engines in Lawndale, CA, for military target-drone applications. Dan Gray was able to post the third-fastest qualifying time with one of these engines, flying the course with an average lap time of 15.830 seconds.



***Induction systems A³.***

### HERBRANSON DYAD 217R

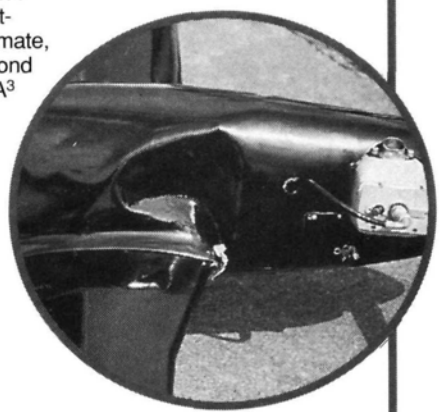
**Displacement:** 217cc
**Weight:** 12.9 lb.
**Prop:** custom, by Dan Gray
**Fuel:** gasoline
**Cylinders:** two in opposition, designed by Herbranson and fabricated by Mahle in Germany, rated at 50 hours
**Crankshaft:** forged steel, rated at 600 hours
**Case:** sand-cast aluminum
**Carburetor:** single Herbranson, 28mm bore
**Brake hp:** 21.2
**Price:** $3,000

Although Dan Gray's airframe collapsed and was not able to complete the trophy race, the engine performed admirably.

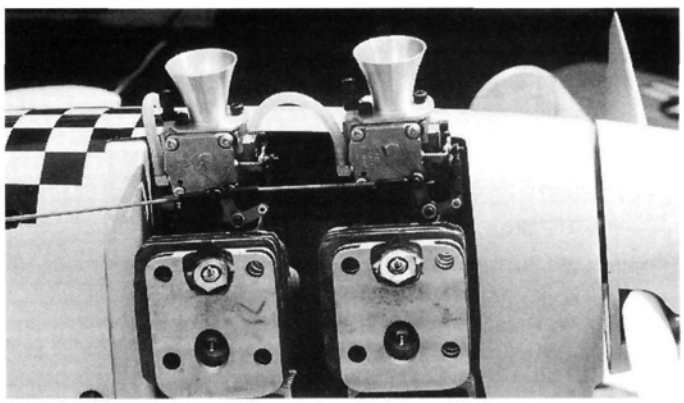
The second engine to fly in the Gold for the first time was the A³ engine—an 8.8-inch opposed twin manufactured by Induction Systems* in Chouteau, OK, for TOC and racing competition. The engine enabled Bill Cunningham to take the top Unlimited qualifier prize and first-place Gold. His teammate, Cliff Magee, took second in Gold with another A³ engine. The engine was developed primarily by Bob and Clark Ayres with help from the rest of the team.

### INDUCTION SYSTEMS A³

**Displacement:** 8.8ci
**Weight:** 8 lb.
**Prop:** APC 22x22
**Fuel:** methanol, 12 percent nitro, 5 percent oil
**Cylinders:** two, opposed 4.4ci, manufactured by Mahle
**Crankshaft:** custom A³ forged steel
**Case:** machined bar stock
**Carburetor:** dual Tillitsons with single-servo bell crank actuation
**Brake hp:** unknown (the A³ turns an APC prop at 22x22 at 8,200 to 8,500rpm)
**Price:** $2,495 (retail), $2,000 (racer's discount)



***Dan's Gray's '93 Reno champion Stiletto suffered from the heat and G-forces. The 40-pound racer sported a 217cc Herbranson drone engine and was built from a D&W Aircraft kit. Dan landed the ailing aircraft, but he was unable to complete the trophy dash.***



***This 6.4ci German "King" twin is the only one in the U.S. Ralph Braun purchased the engine in Germany and took fourth place in Unlimited bronze with it. Import troubles prevent sales in the U.S.***

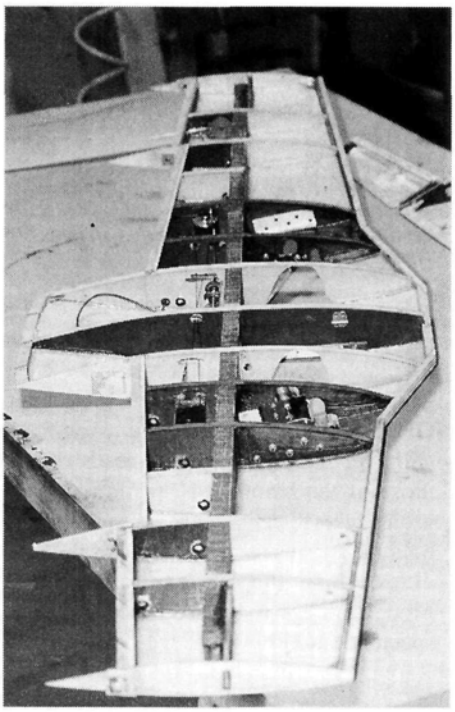
*This Aerrow 200 (shown here by company president Klaus Nowak) was buried 18 inches in the ground when no. 84 lost elevator control and went in at 200mph. Amazingly, only a few fins were broken off!*

they went. Incidentally, Duke and Mel were credited with second and third places, respectively, because Duke's airplane hit the ground after Mel's! Finally, only one airplane (no. 12, flown by Ed Rankin) was left in the air. All Ed had to do was to fly six laps to clinch the win, which he did without a hitch. Unfortunately, he set up a beautiful landing pattern afterward and flew straight into a landing light! All four airplanes were damaged beyond repair.

The Formula One class may turn out to be the most popular of all, since the aircraft lack the complication of retractable landing gear and are easy to build, maintain and fly. According to Lesley Burnett, promoter

*Postmortems are uncomfortable but necessary in the highly competitive field. This is all that was left of no. 84 after it had hit the ground at high speed during qualifying.*

**With lessons learned, Hi-G Promotions will once again team up with the city of Galveston for the Texas Unlimited R/C Air Races from July 10 to 16, 1995.**



*Unlimited racing is the ultimate proving ground for new construction materials and techniques. This P-51 wing is an all-composite, hollow wing with pre-stressed glass and foam skins, and a carbon-fiber, laminated, end-grain balsa "I-beam" spar.*

of the Madera race, as many as 60 Formula Ones are expected to compete at Madera '94 in a no-qualifying, heat-race elimination matrix. It should be exciting to watch.

What does the future hold for big bird racing at Galveston? Despite the tornado that ripped through the pits one night, despite the low spectator turnout, and despite some misunderstandings about the cash purse, most racers I've talked to were impressed with the promoter's hospitality and their willingness to learn, and many racers will go back to Galveston.

With lessons learned, Hi-G Promotions will once again team up with the city of Galveston for the Texas Unlimited R/C Air Races from July 10 to 16, 1995.

For information, call (800) 741-7058, or fax (713) 391-4799.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

HOW TO

# Weight Distribution in Design

by ANDY LENNON

## Proper Weight Placement Enhances Maneuverability

AN ANALYSIS OF the weight of the average .40 to .50 glow-powered, radio-controlled model aircraft with ailerons discloses that the power and control units, combined, weigh very close to 50 percent of the aircraft's gross weight.

The power unit (PU) is composed of spinner, prop, engine, muffler, engine mount, fuel tank, fuel, cowl, fuel tubing and nuts and bolts. The control unit (CU) is made up of receiver, battery, servos, switch, extension cables, foam protection for the receiver and battery, and servo screws. In the design of a model, the distribution of these heavy units along the length of the fuselage has a major effect on that model's maneuverability.

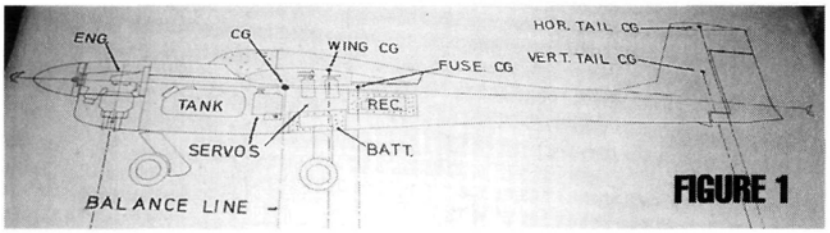



FIGURE 1

***Swift's CU and PU locations.***

Massing both units as close together and as close to the CG as possible while keeping that CG in its design location will result in a highly maneuverable model. This procedure was utilized for the Swift as shown in Figure 1. (See "Balancing Act," May '93 issue.)

Moving the power unit forward by elongating the fuselage ahead of the wing requires that the control unit move aft to keep the CG at its design location. Maneuverability will be reduced as a result. A few simple definitions will help in understanding this reduction:

- **"Moment."** A force times a distance.
- **"Inertia."** The resistance of an object to any change in its motion or to being moved from a state of rest.
- **"Moment of inertia."** The inertia resistance times its distance from some related point. In our case, that "related point" is the model's CG.
- **"Momentum."** An object in motion has momentum equal to its mass times its velocity. In maneuvers, both the PU and CU acquire momentum in a direction different from the original line of flight.

The power unit's weight multiplied by its distance from the model's CG is its "moment of inertia." The same applies to the control unit.

Obviously, the greater the distance of both the PU and CU from the model's design CG, the greater those moments of inertia will be and the greater the resistance to the maneuver.

Also, longer moment arms (in this case, distance of the PU and CU from the CG) require both PU and CU to move through greater distances, for a given angular displacement, as the aircraft maneuvers.

Longitudinally, the moment to overcome the moments of inertia of both units for maneuvers is the model's tail moment arm multiplied by the force generated by deflecting the elevators. (The model's tail moment arm is measured from CG to ¼ of the mean aerodynamic chord, or "MAC," of the horizontal tail.) For a given tail moment arm and elevator force, the greater the moments of inertia of the PU and CU, the slower the model's reaction. Loops will

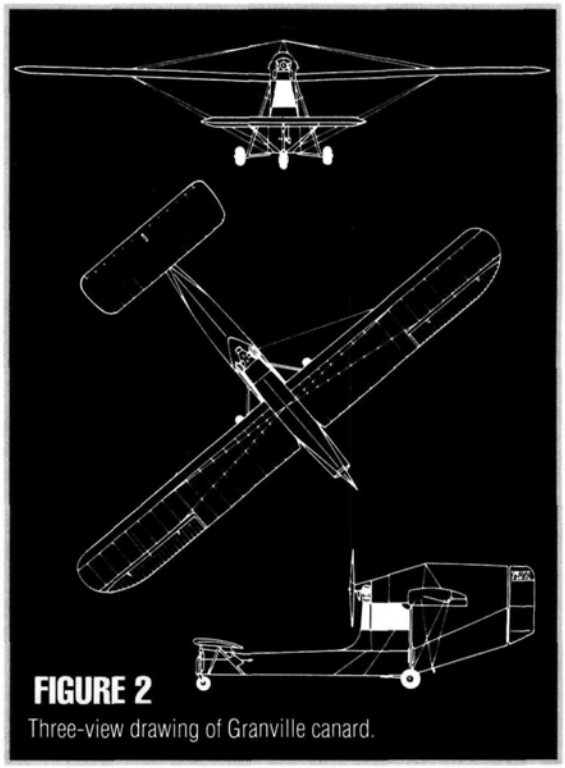


**FIGURE 2**
Three-view drawing of Granville canard.

have greater diameter, and the model will be less agile.

With the maneuver under way, both the PU and CU acquire momentum. To stop the maneuver, this momentum must be overcome. Larger moments of inertia produce larger momentum and slow the recovery from that maneuver.

Directionally, the same applies. The rudder will have less effect in yawing the model. Also, as explained in "Vertical Tail Design" (January '94) and "Spiral Stability Design" (July '94), elongating the fuselage ahead of the CG increases its directionally destabilizing side area, requiring increased vertical tail area for stability and control, further aggravating the situation. Greater moments of inertia have one advantage: they offer more resistance to any disturbance. In level flight, the model will "groove."

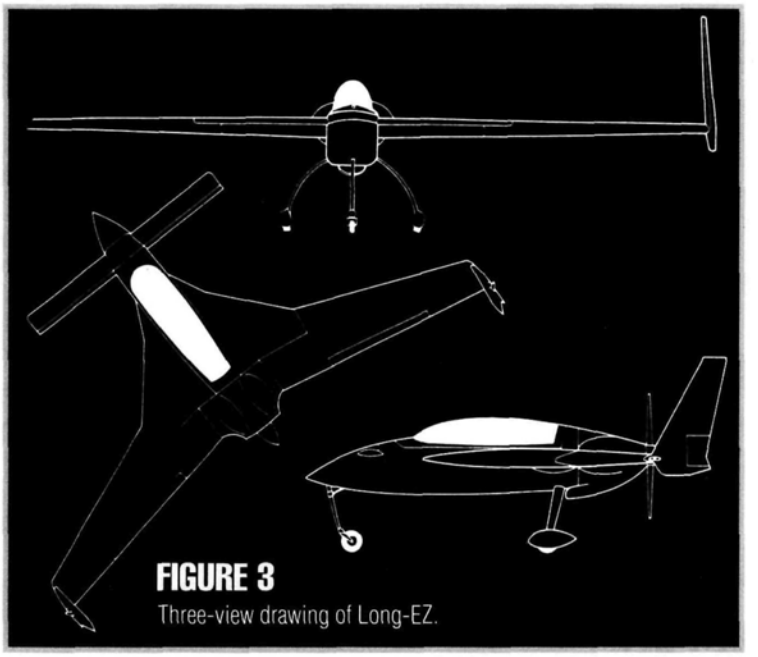


**FIGURE 3**
Three-view drawing of Long-EZ.

## SPINNING

In a tailspin, one wing panel is fully stalled, but the opposite panel continues to lift. The model rotates rapidly, nose-down, around a vertical axis through its center of gravity. Up-elevator and rudder into the spin maintain the rotation.

Centrifugal force acting on the model's components comes into play. Longer moment arms of both the PU and CU result in these units rotating at higher speeds, generating greater centrifugal forces, which act horizontally, away from the spin axis. This action flattens the spin.

The longer moment arms increase the momentum, reduce the rudders' effectiveness in stopping the spin and delay the spin recovery, which could lead to a damaging crash.

## LATERAL CONTROL

Inertia roll coupling ("Vertical Tail Design," January '94) is a consideration in lateral control. For those designs in which the aerodynamic and inertia axes coincide, axial rolls are little affected by larger moments of inertia. In snap rolls and barrel rolls, centrifugal force comes into play, as it does for spins, resulting in slower initiation of and recovery from these maneuvers.

The model's wing is a factor, as it weighs close to 25 percent of the model's gross weight. For good lateral maneuverability, keeping the wing panel's CG as close to the fuselage center line helps. This results from:

- Tapered wing of moderate aspect ratio.
- Ailerons, mass-balanced to avoid flutter, permit aileron and flap servos to be positioned in the wing center section.

While aileron mass-balance weights work against lateral maneuverability, keeping the ailerons light reduces the mass-balance weight correspondingly. Freedom from dangerous aileron flutter greatly outweighs the small reduction in maneuverability occasioned by the mass-balance weights. The same comments apply to mass-balancing of elevators and rudder.

## REAR ENGINE CANARDS

For conventional designs, it is not difficult to position both power and control units so as to minimize their moments of inertia.

Rear-engined canards, without aft wing sweep, are a different matter. Such aircraft have their CGs between fore and aft wings, closer to the latter. The PU at or behind the aft wing is balanced by locating the CU as far forward as possible. In most cases, additional ballast is required up front to locate the CG correctly. The moments of inertia of both units (and ballast) could not be greater.

My swan canard was not intended to be aerobatic, but in level flight, it grooved beautifully. There are canard configurations that have lower moments of inertia.

- **Granville canard (Figure 2).** Both PU and CU (the pilot) are located close to the CG for good maneuverability. A modernized version of this clever design would be interesting.
- **Rutan's Long-EZ (Figure 3).** The sweptback aft wing permits the PU to move forward, shortens the fuselage and permits the CU (pilot) to move aft, close to the CG. The big wing-root strakes house the fuel on the CG. The wingtip vertical surfaces have reasonable moment arms for good directional control, but their location increases the wing's moment of inertia, reducing lateral maneuverability.
- **Miles Libellula (Figure 4).** This was a British wartime design. The twin engines ahead of the moderately swept aft wing bring the power units closer to the CG longitudinally. Both fore and aft wings have flaps. Note the high-aspect-ratio foreplanes on both the Long EZ and the Libellula.

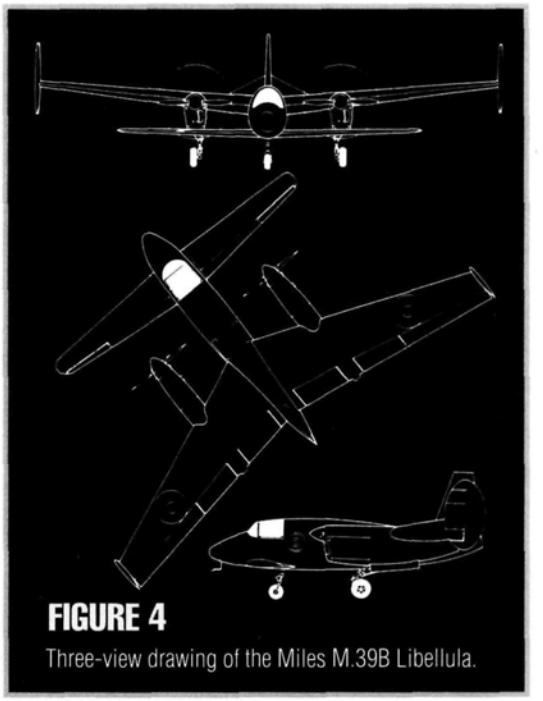


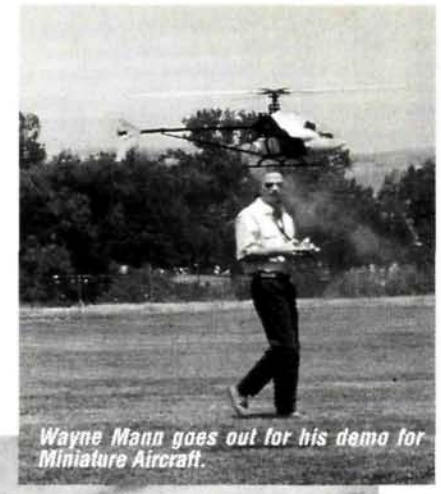
**FIGURE 4**
Three-view drawing of the Miles M.39B Libellula.

Happy maneuverability. ■

# Bakersfield Heli Fun '96

## Fly Meeting of the Rotary Club!

by ELAINE JACKSON



Wayne Mann goes out for his demo for Miniature Aircraft.

Gigi Schell, winner of the .60-size maze.

PHOTOS BY LES JACKSON

THE KERN RIVER Blade Runners (KRBR) Fifth Annual Bakersfield Fun Fly, cosponsored by Miniature Aircraft and *Model Airplane News*, was held on April 29 to May 1 under perfect weather conditions. This year, the fun fly included helicopters from the United States, Germany, Finland and Austria. There were 159 pilots and nearly 300 helicopters at this three-day event, and all agreed that this was the ultimate in helicopter fun flys.

One key element that contributes to the event's popularity is KRBR's superb flying site that consists of 83 acres of low-cut grass (equivalent to 18 soccer fields). According to club members, when they opened the gates on Friday at 5 a.m., the cars and RVs were already lined up!

Manufacturers, distributors and hobby shops donated more than $5,000 in prizes for the contest events and raffle. The grand raffle prize was a ready-to-fly X-cell Pro gas helicopter donated by Miniature Aircraft* and won by Ellen Price of Utah (she also won an Enforcer ZR* in the raffle).

Steve Harris's "KNBC-TV."

### NEW FACES

Attending Bakersfield for the first time was Steve Helm, national marketing manager of Futaba Corp*. He's well-known for his


*Second-place in Scale Class was Gary Kurtzman's "DPS Air Rescue."*


*Scale class first-place winner Walt Ferar's "Santini Air."*

*Team Kalt members, from left: Ken Marshall, Gary Kurtzman, Marty Kuhns, Len Sabato, Brian Suarez.*

FAI pattern flying, but he proved that he can also handle a helicopter. Steve flew an X-cell Pro that had a beautiful Optima fuselage painted by Cliff Hiatt. Also at this event for the first time was Wayne Mann, who represented Miniature Aircraft. He has been a top winner in helicopter competition since 1990 and was a member of the winning 1993 U.S. World Championship Team.

## EVENTS

Although Friday was the official start of the fun fly, the actual competition was held on Saturday and Sunday. All the contest events were held on the alternate flying area, which left the large primary area for open flying.

This year, the novice event consisted of three timed parts. The first phase started with the basic heli-pad hop; the second involved flying two figure-8s; and the third event involved flying the heli under a "limbo" pole. This was first-place winner Jim Christian's first helicopter event.


*Al Wert's Hirobo Huey.*

*Winner of the Model Airplane News Technical Achievement Award—Walt Ferar's Skyeye II.*

## *Model Airplane News* Technical Achievement Award

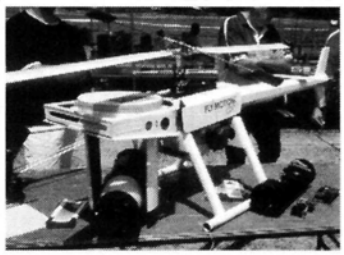
Flying an R/C helicopter is a technical achievement all in itself. This Pilot's Choice award had seven innovative entries.

• Don Harris made his own helicopter parts out of "tinseloy"—a material that's stronger than 6061 T6 aluminum and costs only about $1 a pound. He took night classes to learn sand casting.

• Dennis Nelson installed an O.S. .91 ducted-fan engine with a SuperTigre carburetor in a helicopter. He's running an 11.1:1 gear ratio. This was not the engine that Dennis scored a second with in the pylon racing; perhaps he will use it next year.

• One pilot made a muffler out of a mousse can. He claims a power increase of 10 to 20 percent above the standard muffler. It weighs only 3 ounces.

• One pilot designed and made his own blade balancer.



*Joe Jopstl's entry in the Model Airplane News Technical Achievement Award is a MotionCam used for film making in California.*

• Marco Senoret is probably the only man in this country who has successfully used the Davis Diesel Conversion in a helicopter. Marco has been working with the diesel conversion for almost three years. At first, he used Davis's recommended fuel formula, which didn't work adequately in a helicopter. He found that he had only 60 percent of the power, and it left a gooey mess on the helicopter. He experimented with his own fuel mixture, which is 2 gallons of the Davis blend to 1 quart of Castrol Syntax 5W 50 oil, with fantastic results. This fuel blend gives him plenty of power with minimal, easy-to-clean residue. Although this fuel blend isn't less expensive than glow fuel, he can run for 25 minutes on a tankful. His favorite conversion is the O.S. 61 SXH because it's so user-friendly. After running a full tank of fuel doing aerobatics, you can immediately hold the muffler without getting burned.

After running almost 2 gallons of fuel through his SX, Marco took the head off to check the engine. The piston and the head were as clean and shiny as on the day he installed them. Marco has also successfully converted a SuperTigre 90 and 34 for helicopters. If you want more information, contact him at (619) 460-0889.

• Joe Jopstl displayed the MotionCam flying camera. He's part of the MotionCam team that uses it for professional filming in Southern California. The MotionCam is not a standard model helicopter kit that has been converted for photography.

• The winner of the *Model Airplane News* Technical Award was Walt Ferar with his Skyeye II. Walt modified a Legend Elite to utilize a Canon AE1 with through-the-lens video assist. The entire helicopter weighs 13.75 pounds. In designing this system, he had to isolate the helicopter vibration from the camera, design a lightweight video camera transmitter combination and, most important, isolate the flight-control receiver from the video transmitter's RF. After scanning the site to be photographed, the helicopter is flown into the proper position to take the picture. The camera operator, watching a live, down-linked, through-the-lens picture, points the camera and operates the shutter from the camera control console. The camera sends a signal to the ground that confirms the picture has been taken. Walt had on display an album of professional-quality photographs he has taken with this setup.

## BAKERSFIELD HELI FUN FLY


*The "NUTS" club from Utah.*

A popular event at Bakersfield is the heli-maze—a timed event in a maze configuration. Two courses are set up—one course for .30- and .40-size helicopters and a separate one for .50s and .60s. If you hit the balsa sticks marking the course, you're disqualified. Wayne Mann tried the course "just for fun." He almost made it, but he hit the sticks at the very end. He was flying a gas X-cell Pro with 690mm blades. When the maze narrowed, he had about ½ inch of clearance. Although no one completed the .60-size maze, the official winner was Gigi Schell. This was probably the first time a woman has ever won an event at Bakersfield.

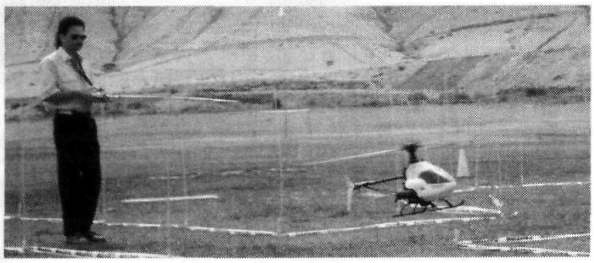
The scale competition had six entries. The helicopters are required to fly a basic course as well as compete in the static display. Walt Ferar's nine-year-old "Santini Air" Jet Ranger, modeled from the helicopter in the "Air Wolf" TV series, won first place.

New this year, the Expert Aerobatic event consisted of two mandatory hovering maneuvers, four mandatory flight maneuvers and 90 seconds of freestyle.

### PYLON RACING

This was definitely one of most exciting events I've ever seen. Each race consisted of 10 laps around three pylons. Starting from the hovering position, three helicopters raced together. The pilots provided their own callers to inform them when they rounded the far pylon. Three flag men/scorers were directly in line with the far pylon to notify the caller when his pilot had passed that pylon.

For obvious reasons, the KRBR maintained strict safety procedures during the pylon racing. The first race of the series was uneventful. During the second race, Wayne Mann came up underneath Walt Ferar right after the second turn in midair! It rained X-cell parts for about 30 seconds. Ferar, who landed without even breaking his main blades, sustained less than $100 worth of damage. Mann wasn't as lucky, although his carbon-fiber side frames weren't cracked. The Best of Show award went to Ferar for his performance during the incredible midair.



*Wayne Mann in the maze.*

In the third race, Tim Lampe, Nick Nickolas and Kenny Mooers each raced a Concept* 60. Kenny Mooers won that race after Nick hit the pylon. The final race was between Kenny Mooers, Dennis Nelson and Marty Kuhns. Mooers had to pull out of the race, leaving Nelson ahead of Kuhns. Everyone thought Nelson, flying his Tech Specialties* Phoenix, powered by a modified O.S.* 61 RFN with a V-Tech muffler, had it won. In the last lap, however, Nelson smacked the pole so hard that he bent it! The official winner was Team Kalt member Kuhns, who was flying a Kalt Baron Alpha II powered by an O.S. SFN 61. The 15 courageous pilots who entered all agreed they knew the risk, but it was absolutely worth the thrill.

### DEMOS

On Saturday, the noontime demo flights lasted for more than 1½ hours. The first flier was Tim Lampe (product manager at Great Planes), flying the brand-new Concept 30 SRX powered by the new O.S. 32SX helicopter engine. Shaw Berkheimer flew the new American-made Ninja Pro manufactured by Century Helicopter Products*. Ken Marshall (Team Kalt) debuted his beautifully painted Kalt Grand Prix that featured the new KSJ swing rotor head.

From Germany came the impressive Volker Swoboda, the German National Champion in 1990 and 1991 and Graupner*-sponsored pilot who flew a Heim Unistar 60 mechanics in a Slimline* fuse-

*Joe Frazer's Concept 60 rigged with lights for night flying.*

# Night-Flying Helicopters

**Night-flying helicopters have become a tradition at this Bakersfield event, because of the large open area with no surrounding city lights. When a helicopter performs aerobatic flying at night with the rotor blades lit up and cyalume flares attached to the boom and skids, it resembles a UFO. Merle Rappaport installed three LEDs powered by four lithium watch batteries in each blade. He then covered his blades with Ultracote. Joe Frazer had his own unique design lighting up his helicopter. He installed a 6-inch-long, ultraviolet black light on each side of the helicopter and one off the nose of the canopy. He then painted the underside of his blades with an ultraviolet fluorescent paint, which gave his helicopter a purple glow. Three LEDs powered by Ni-Cd batteries were installed in the blades. Kenny Mooers is the only person I've ever seen fly a helicopter without the main rotor disk being lit. Kenny flies only with the cyalume sticks on the skids and the boom. Just landing a helicopter in the dark is difficult, but to watch Dave Botita do his high-altitude autorotations was quite remarkable.**

*Novice winner Jim Christian with trophy donated by Miniature Aircraft.*

lage with a Graupner speed controller. The most awe-inspiring demo flight was made by 14-year-old Vincent Trino—a KRBR club member, who is probably the world's youngest sponsored helicopter pilot (he's sponsored by Miniature Aircraft, Futaba and Powermaster* fuel). This was Vincent's first demo flight, and his sideways tumbles, 720 knife-edge and his version of the "death spin" were incredible. It has been his good fortune to spend time with the well-known Curtis Youngblood. Vince has become a skilled helicopter pilot in just two years. This year, he plans to enter the Nationals, and he has been invited to enter the Gauntlet, which is an FAI Invitational.

Joe Jopstl performed a demo flight with a Vario Sky Fox that was powered by an O.S. .91 Surpass 4-stroke. Joe runs the only model helicopter school in California. For years, Robert Gorham has been admired for his smooth flying and impressive autorotations. This year, in his demo flight, Robert must have set some kind of distance record. Flying his beautiful TSK Blackstar (Black Shark fuselage) to the far end of the field, he made a high-speed pass when his engine quit. He executed a perfect emergency autorotation from at least 1,000 feet away without any damage. Marco Senoret performed a surprising demo with a Concept 60 SR that was powered by an O.S. .61SX that had been converted to use a specially formulated diesel mixture with the Davis Diesel* conversion. I was surprised to see the power of this setup.

The long lineup of demo fliers continued with Marty Kuhns (Team Kalt*) flying an Enforcer ZR, Anson Hargrov of Texas flying for Miniature Aircraft and Tony Davis flying for Kyosho*. The final demo flight was made by the remarkable Wayne Mann, who flew an X-cell Pro. This was the first time I've had the opportunity to see Wayne fly. His 4- and 8-point rolls were excellent. He ended his demo with an autorotation and a complete pirouette at the bottom.

*Team Kalt with pylon race winner, team member Marty Kuhns.*

*Mike Lerner's Bell 47G.*

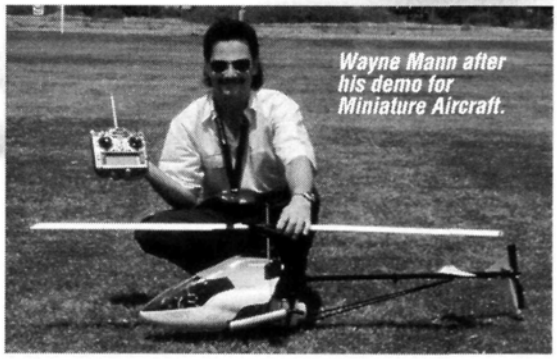
## EXHIBITS

Ed Turner displayed his unique, scratch-built, 1/4-scale Bell 47G that was powered by a Zenoah* G62. The swashplate was the most difficult part to build. The diameter of the main rotor blades was 9 feet.

Tim Lampe debuted the new Concept 30 SRX. This latest version of the Concept 30 SR features a one-piece servo frame and bottom tray, push/pull on cyclic controls, aluminum-tube-guided 2mm tail-drive wire, a new tail-rotor hub, tail grips with dual radial bearings in each grip, and a new-style body with easy on/off body latches. I was surprised to see many of the new Concept 60 SRs at this event, because they had only been available for a few months.

*Tim Lampe's beautiful Concept 60 SR in an Interceptor fuselage*

At the Vario display, Joe Jopstl showed me the versatile Vario Sky Fox powered by an O.S. .91 Surpass that he flew in the demo. The Sky Fox can be converted to a .60-size electric helicopter in about half an hour. It also can be reduced from a .60 machine to a .40.



*Wayne Mann after his demo for Miniature Aircraft.*

Ken Eckhaus, manufacturer of the Tele-Tach and the Throttle Jockey, was available to answer questions about the precision Sundance* electronic gyro. Joy

*(Continued on page 104)*

## WINNERS

**Novice Event**
1. Jim Christian
2. Kevin Scofield
3. Bill Malvey

**BEST OF SHOW—**
Walt Ferar

**HELI MAZE**
**(.60-size )**
1. Gigi Schell
2. Scott Emling
3. Rich Miller

**(.30-size)**
1. Frank Taylor
2. Doug Adams
3. Tony Sarra

**SCALE**
1. Walt Ferar—"Santini Air"/Jet Ranger
2. Keith Griffin—Tow Cobra Schlüter; Gary Kurtzman—"DPS Air Rescue"/Kalt
3. Al Wert—Huey/Hirobo

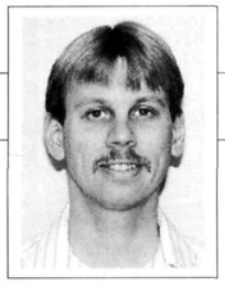
**EXPERT AEROBATICS**
1. Wayne Mann
2. Peter Chao
3. Kari Porokka (Finland)

**PYLON RACING**
1. Mary Kuhns
2. Dennis Nelson
3. Kenny Mooers

***MODEL AIRPLANE NEWS* TECHNICAL ACHIEVEMENT AWARD—**
Walt Ferar

**HELICOPTER COUNT**
X-cell—69 (36%)
Kyosho—33 (17%)
Kalt—28 (15%)
TSK—11 (6%)
Hirobo—10 (5%)
Schlüter—9 (5%)
GMP—9 (5%)
Vario—9 (5%)
Graupner—3 (2%)
Other—2 (.5%)
Heim—1 (.5%)

# CENTER ON LIFT



MICHAEL LACHOWSKI

## WINCH BATTERY TERMINALS TO FIELD REPAIRS

THIS MONTH'S COLUMN is a collection of miscellaneous topics. Where do I get these ideas? Most of them come from watching others fly, seeing what they do right and learning from their mistakes. You can send in topics that you would like to see discussed, but I won't make any promises as to when they'll make it to the top of the list.

The first things I'll discuss are winch batteries and battery cables. From time to time, I've seen some pretty bad setups that result in poor winch power and short battery life. I wish every launch could have the energy of a fully charged battery. Next on the list is some tape you can use for quick field repairs. With the right techniques, some repairs are quicker than using CA. Finally, I have some international sources of information for our soaring addiction.

### WINCH BATTERIES

Winch batteries are the source of power for flatland launches. All too often, I see these batteries abused; this shortens their life and reduces launch height. Here are a few tips to increase battery life, get more launches out of a battery and make everyone using the equipment happy.

The worst thing you can do to a battery is to fully discharge it. Next on the list is leaving the discharged battery sitting around for a week before recharging it. Frequently, batteries have indicators that show how charged they are. When the charge gets below 50 percent, you should switch to another battery. When you get home, the first thing you should do is charge your winch batteries. If they're maintained properly, you won't notice a decrease in capacity for at least two years, and you might get several additional years of service from them.

Now let's look at how to connect batteries to the winch. One of the worst ways is to hook two batteries in parallel to a winch. This only causes the batteries to "fight" each other; the capacity of one battery is used to charge the other. Never put batteries in parallel on a winch.

The easiest way to get more power out of your winch is to work on the battery cables. The current draw of a stalled winch motor can easily exceed 500 amps. Power losses in the cables and connections can be quite significant. To minimize power loss, use the heaviest-gauge wire possible, and keep the cables short. Reducing your 2-foot-long battery cables to the minimum length necessary can increase the current to the motor by 10 percent or more. Find a source of welding cable and use 4-gauge or thicker wire. You'll find that welding cable is much more flexible and easier to work with than standard battery cable.

Another excellent way to increase battery life on a Ford long-shaft winch is to add ball bearings. Doug Boyd's Real Balls* conversion kit for Ford winch motors has replacement ends that include ball bearings. The bearings have much less friction than the standard bushings, so you won't have to pulse the winch as much to get the same amount of power; this extends the winch-battery life. Supporting both ends of the shaft with bearings also reduces the amount of arcing on the brushes.

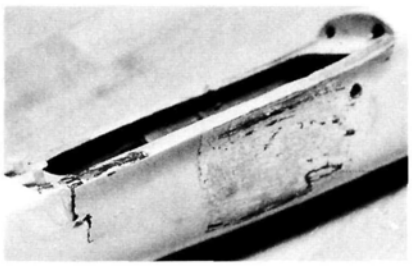
### QUICK FIELD REPAIRS

Midair collisions and quick field repairs are quite common in hand-launch-glider (HLG) flying. Three or four models, all working the same thermal down low, frequently results in collisions, and some may require field repairs.

## WINCH BATTERY TERMINALS

**Quick Cap Battery Connectors* make life much easier when you set up a winch. One really nice set of connectors just slides over the battery post and then snaps down to lock on the post. The connector can also serve as a quick disconnect. These connectors are similar to those used on the Graupner winch from Hobby Lobby*. You might be able to find quick-connect battery connectors in a local RV-supply store. If not, you can mail-order them.**

***Snap-on battery terminals like the ones shown make life much easier when you set up your launch winch.***



***This well-flown, electric-powered sailplane is showing the stress of years of landings. The fuselage has split near the back of the wing saddle.***

***The flying field "quick fix": apply aluminum tape to shore up the fuselage until proper repairs can be made at the workbench.***

Although we frequently strive for light weight in HLG construction, durability shouldn't be overlooked. If repairs are needed, most people use CA to glue things back together; however, this can be a problem in the middle of a contest—especially if you damage your model during a round. Repairs must be completed quickly so you can get the model flying again. The best repair material I've found is thin aluminum tape. It's sold in automotive departments for muffler patching and other car repairs. It's strong, and the adhesive sticks well to models. I've actually repaired part of a stabilizer that broke off by putting the parts together and wrapping tape around the assembly to hold it together. I was able to complete a contest with this repair.

In another instance, the bottom sheeting on my wing cracked because of earlier leading-edge damage. Rather than using CA and fiberglass, I applied some strips of aluminum tape and, after taking 15 seconds to look over the damage and repair the wing, I was flying again. This is much faster than trying to find the CA, kicker and fiberglass to make a conventional repair.

Another handy use for this tape is to attach ballast to the wing. I was able to put 10 ounces of ballast in a Monarch by taping lead strips under the wing and putting some additional ballast just in front of the wing to maintain the CG location. This is really amazing, considering that all the ballast is internal and the model weighs only 9 ounces.

### MORE ON F3J

For those of you who are interested in learning more about F3J, Jack Sile is producing "Thermal Talk, the F3J Newsletter" that's dedicated to this subject. It features quite a bit of information on the European F3J league. Especially interesting are notes on models used in the competitions. Several three-views of various designs were published in a recent issue, so it was easy to see that the designs are much larger than the typical American thermal design. Wingspans of over 11 feet and areas of over 1,100 square inches are quite common. These are especially useful in the long, 15-minute fly-off rounds at F3J contests. U.S. subscriptions for this bimonthly publication are $10.50. Send Jack some information on your own F3J contests and activities.

No full-size magazines dedicated to soaring are published in the U.S., but it's a different story in Europe. Dave Jones recently launched a new monthly magazine, *QFI*. It covers thermal soaring, slope and electric. It's quite an ambitious undertaking and is dedicated to our favorite topics. The first issue contained several pieces from American authors, and there's enough space for very detailed coverage on many topics. Yearly subscriptions are $42 in the U.S.

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

with thin Zap* glue. At the field, it takes less than 5 minutes to assemble the finished biplane.

I made the machine guns out of scrap pine blocks and pieces of ¾-inch-o.d. PVC pipe. From 5 feet away, they look acceptable. The pilot figure is a modified 1/5-scale naval aviator from Vailly Aviation*. I cut off the Mae West life vest and covered the torso with heavy-duty aluminum duct-tape, which, when pressed on, wrinkles and folds just like old leather. After I had painted it semi-gloss black, it looked just like an old flight jacket. The fur collar came from an old teddy bear that my daughter Rebecca left in the workshop. (I did buy her a new one!)

The tail skid is made of ¼-inch-thick maple, and it pivots on a 4-40 bolt to absorb shock. Inside the fuselage, just under the horizontal stab, I attached a spring to the top of the skid. I anchored the other end of the spring to a plywood plate that I glued into place before covering the fuselage. This detail is included on the plan. If the spring needs to be replaced, a small amount of the covering material can be cut away and patched with cloth or an aluminum plate.

## RADIO INSTALLATION

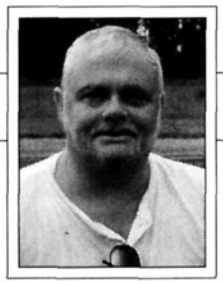
I used a JR-Remote Control* X-347 computer radio to control the D-VII (I've never had problems using this radio with spark-ignition models). I used a 517 servo and a plastic flex pushrod for throttle control and a pair of 517s for the ailerons (one mounted in each upper wing panel). The rudder is controlled with a 4735 high-speed servo, and the split elevator halves are moved with 4131s. I used Sullivan* Kevlar pull/pull cables for the rudder and carbon-fiber flex rods for the elevator. Both the twin elevator servos and the twin aileron servos are connected to the receiver with Y-harnesses, and I used a 1200mAh Hitec* receiver battery to drive the servos.

## ENGINE INSTALLATION

To feed the Zenoah G-38 engine, I installed a huge 24-ounce fuel tank and a Du-Bro* Kwik Fill fuel fitting. I used B&B's* engine mount and smoke muffler but, so far, I haven't installed a smoke-pump system. The engine is hard-mounted to the firewall with 10-32 steel bolts and fender washers. I used a Zinger* 18x8/14 prop—a powerful combination. The fuel is a 40:1 mixture of gasoline and Robart's Snake Oil 2-stroke oil. I also use their

*(Continued on page 104)*

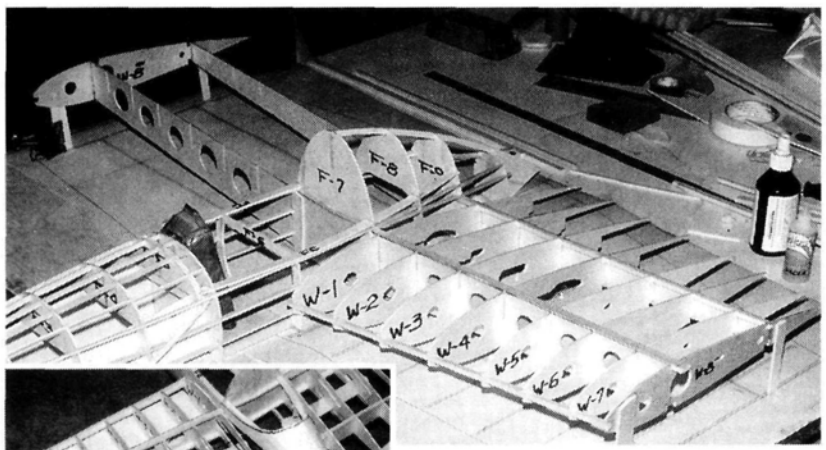
# SPORTY SCALE TECHNIQUES



FRANK TIANO

## COOL TOOLS AND A HATCH TIP

I DON'T KNOW about other mags, but I gotta tell ya that here at *Model Airplane News,* we really listen. For example, when we ask what kinds of stuff you guys really want to see each month, the "how to" article is almost always right up near the top of your list. The problem is that as I get older, I forget which "how to" stuff I've already covered and how long ago it was! Hopefully, in a few years, when we all get caught up, I'll be able to repeat myself without embarrassment. For this month, though, I think I've got some new material.




***Nick Ziroli Sr.'s P-38 will feature all-wood construction, and fiberglass booms will be offered sometime in 1995. The P-38 features Fowler flaps.***

### COOL TOOLS

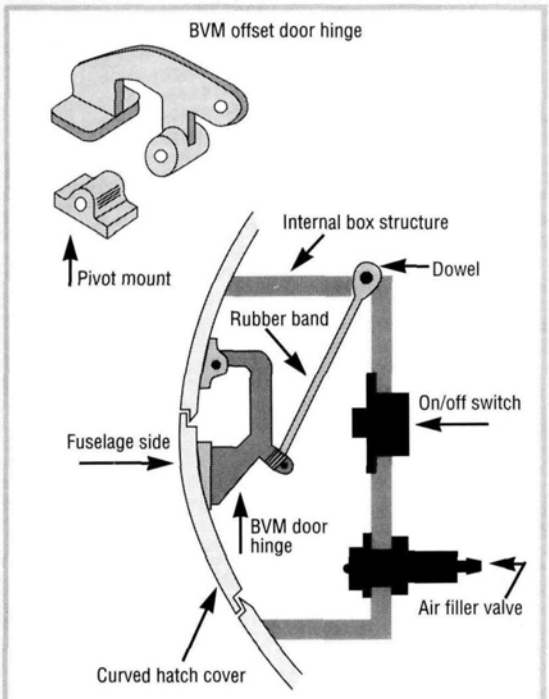
I'm often asked if there are any special tools I feel my workshop really couldn't do without. The answer is a very simple and direct yes—all of them! Seriously, any modeler worth his weight in carbon fiber would just love to have any and every tool imaginable, but sometimes other things take precedence—like food, gas and rent, for example. But sometimes we can find that little jewel of a tool that costs almost peanuts, but works like a $50K laser. I think that the Dremel Freewheeler is one of these. We now have five of these battery-powered Moto-Tools in the shop, and my main guy, Pat McCurry, and I almost always grab one of them before the ones with the long, dangly thing attached. The Freewheeler has a list price of more than a hundred bucks, but several enterprising hobby shops regularly have them on sale for between $60 and $70. I'm tellin' you—this little gizmo is unbeatable for quick grinding or routing jobs. If you're lucky enough to have more than one of them, you'll find that there's always a charged tool waiting for a job. If you're really slick, at holiday time, put the Dremel Freewheeler on any list that you give to anybody who's gonna buy you something. That way, maybe you'll get four or five of the little suckers and be able to do what Pat does: put a different bit in each tool so that you'll never have to change bits—just grab the special Freewheeler for the job!

A toenail clipper (the type for dogs, not humans) is an indispensable, cheap little tool that's probably used at least half a dozen times on any airplane we build. It allows you to get into fairly tight spaces and makes smooth, perfect cuts in any non-steel material, such as inner and outer Nyrod material, fuel tubing, soft plastic rod and up to 1/4-inch electrical wire. What makes the clipper so great is that it doesn't roll the edges of the material over as you cut, so if something gets sleeved inside the piece you're cutting, it will still fit—and slide—perfectly. No ragged edges!

My recommendation of the month really isn't a tool but a series of offerings from a single company. At Top Gun this year, I met a neat guy, Ian Richardson, of England. He purchased some booth space along manufacturers' row and demonstrated the most phenomenal line of sanding and grinding tools and accessories I've ever seen. The parent company and trade name of these tools is Perma-Grit*. Essentially, they're tungsten-carbide rotary bits for your Dremel tool that last about forever. They come in several shapes and sizes and make routing holes in ribs or formers an easy chore, and they can do all your Dremel-type sanding as well. Best of all, they put tungsten carbide on a cool aluminum sanding block with a medium grit on one side and a heavier grit on the other. Once again, I don't think you'll ever wear the thing out. This block is absolutely the best tool you'll find for sanding and producing contoured, matched, rounded leading edges. It tapers trailing edges perfectly also. If you see Perma-Grit tools advertised anywhere, go ahead and treat yourself to as many as you can afford. They're a little pricey, but when you consider

# TOP-SECRET ACCESS DOOR!

How many times have you thought that switches, air-fill valves and charging jacks sure looked out of place on the side of an otherwise pretty good-lookin' scale model? How many times have you thought of putting all that paraphernalia in one tidy little place that does nothing to upset the great lines of your new model? Until recently, my answer to those two questions would have been, "Always, all the time." Some super craftsmen enjoy making sliding canopies and then hiding all the aforementioned down inside there somewhere. I have a problem with that: my hands are a little too big, and I personally don't always want to install a sliding canopy. The answer is simple: just find a place where you can put an outside hatch of some sort—a place where the fuselage is clear of obstruction on both the inside and outside.




Cross-section of internal box structure for hidden radio switch, air valves, etc.

If the full-size airplane doesn't have a hatch where you'd like to have one on your model, just make one on the "other" side—the side that's not judged—if you're in competition. As long as the hatch door looks like it's supposed to be there, you'll be just fine. The door may be made of a couple of pieces of sheet fiberglass (or even plastic) that have been curved to match the fuselage contour and then Zapped* together. Using two pieces glued together will ensure that the curvature will always remain the same. Next, cut a section out of the fuselage that's just a wee bit smaller than the hatch—maybe 1/16 inch all around—and build a lite-ply box and glue it inside the fuselage to cover the hole you just made. The back of the box will become your service panel, and this is where you'll drill and cut appropriate-size holes and slots to accept your charging jack, air-fill valve, a push/pull wire for switch activation and even other things, like an onboard glow battery-charging jack. If you've got a whole bunch of stuff, maybe two hatches would be a better idea.

Fasten the hatch door to the fuselage with a BVM* offset door hinge, and use a small rubber band as a spring to keep the door closed. I guarantee that this will look cool, and your friends will think it's quite professional. Best of all is the supreme satisfaction you'll get when you notice others who quietly try to figure out where all your switches and stuff are, but don't want to ask. And these little hatches can be put anywhere. Pat McCurry has his retract air-fill valve under a small door right on the top surface of the wing panel of his Platt ME109. It's functional, and it looks absolutely perfect.

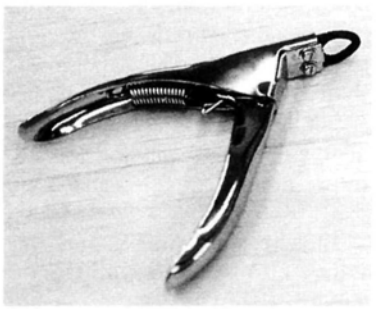
that you may actually be able to will them to somebody, they're probably worth every dollar!

### HINT OF THE MONTH

Masking tape can and should be one of the most valuable aids in your shop. No, I'm not going bananas just yet; I mean it. Now, I know that many of us use masking tape for painting and holding things in position while glue is drying, but its uses don't stop there. No sir, buddy. Wide masking tape should always be used around the perimeter of your work area to prevent adjacent wood from getting beat up by the sanding block. And when you don't have any MonoKote* to act as a release paper when making resin microballoon filler for wing-to-fuselage joints, masking tape will work. We always use it to mask off any area of a finished airplane if we have some repair work to do. We always use a top-quality tape, such as that made by 3M, because we find that the amount of glue residue it leaves behind is far less and much easier to clean off than that left by cheaper brands. Also, if you ever spot blue or lime-green masking tape that sells for a bazillion dollars a roll, it's truly great stuff. This colored tape is usually about three times the price of a comparable roll of 3M tape, but it can be left on a canopy, for example, for months without worry. It stays flexible and doesn't crack with age. And by the way, any time you do have some tape-adhesive residue on your canopy or other finished surface, the safest thing you can use to remove it is plain old mineral spirits. It won't harm the plastic and does a fantastic job.

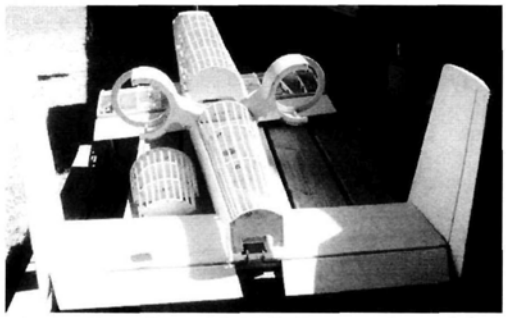
### A PAIR OF TWINS

Two of your favorite designers/scratch-builders are feverishly working on twin-engine subjects that should soon be ready for publication; at this time, only plans sets are in the works, not full-blown kits. From the pictures printed here, I'm sure you'll recognize everybody's favorite twin-engine WW II fighter, the Lockheed P-38 Lightning, and almost everybody else's favorite modern-day ground-support aircraft, the Fairchild-Republic A-10 Thunderbolt II, more affectionately known as the Warthog by the guys who fly it. Well, Nick Ziroli Sr.* is getting the '38 ready while the mad doctor from the West, Tim Farrell*, is just about finished with the A-10. The P-38 spans 114 inches and is scheduled for two of those new, fantastic, Zenoah* G-45s turning scale three-blade props—counter-rotating! Look for a 40+ pound hit on the scale. The A-10, on the other hand, will use two ducted fans for power and will weigh in at under 38 pounds. It also spans 114 inches and should prove to be a very stable machine. As I recall, every exact-scale A-10 that I've personally seen has flown well, as long as it had more than 80 inches of wingspan. I'm sure Tim's will do very well. As for Nick's P-38, when was the last time one of his designs didn't do well? Well, now that I mentioned it, there was that scale-up of the Aurora Yak 25 that never got off the ground back in '77. Course, the real one never broke ground, either!



***This is what a dog's toenail clipper looks like. It costs about 10 bucks, and it will last forever—unless you use it to cut music wire!***

So, that's about it for another issue. After that excellent Top Gun coverage by Major Tom last time, everything else in my measly little column will probably pale by comparison for the next few months. Guess I'll have to try even harder! Oh, by the way, I'm just about out of pictures from you guys, so if you'd like to see your latest creation in print, send me a photo or two, and let's see if we can share your interests with others. Color prints are just fine as long as they're in focus. Until next time, let me remind you of the famous words uttered by flight "leftenant" Steve Stunning flying his Spitfire MK IX back in 1941, somewhere over Duxford, England, when the group leader announced, "Bandits at two o'clock!" Stunning's reply: "Roger, leader, but what do we do until then?" Your six is clear.



***Tim Farrell's all-wood A-10 is 50 percent completed. This project should be done by Christmas 1994. Simple methods were used to build this inexpensive, but durable, twin-engine subject for two Dynamax* fans.***

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

## FOKKER D VII

*(Continued from page 99)*

R/C engine fuel treatment to help reduce corrosion and improve overall engine performance.

### CONCLUSION

At the flying field, the bright red Fokker is impossible to miss. A few of my fellow FLYRC club members showed up at the field to enjoy the sunny afternoon, and they all loved the model. I checked the engine's noise level and found that the G-38 was putting out a noisy 101dB at 9 feet. An after-muffler and a prop with a larger diameter reduced the noise to an acceptable level. The Zenoah was finally started, and I taxied the big biplane to the end of the runway. As I advanced the throttle, the only thing missing was my leather flying helmet, goggles and a white silk scarf!

I highly recommend the Aeroplane Works kit to anyone who knows how to build wooden kits. The Uravitch-designed Fokker D-VII is an attractive, giant sport-scale flier that's perfect for anyone who wants an easy-to-fly WW I warbird. Rhinebeck, here I come!

**Addresses are listed alphabetically in the Index of Manufacturers on page 137.* ■

## BAKERSFIELD

*(Continued from page 93)*

Taylor and Nick Nickolas were busy selling after-market helicopter accessories. Peter Chao and Shawn Berkheimer of Century Helicopter Products displayed the new Ninja Pro. In the Bergen Machine* booth, Larry Bergen helped his West Coast rep, Tony Sarra, sell his popular X-cell performance helicopter parts. On display was the Bergen Gas X-cell conversion kit. Two of Larry's new items are his high-efficiency cooling-fan assembly (part no. 135) and the new clutch-bell assembly (part no. 140). This fan comes with a self-centering fan hub and dual self-centering collets; there's no need to use a dial indicator to set it up. Bergen's new clutch-bell unit comes with a large bearing in the bell itself. The clutch bell comes with the lining, a 10-tooth pinion and a triple bearing block that supports the pinion with a large bearing and the start shaft with two smaller bearings.

At the Horizon* booth, Len Sabato (product manager) from Horizon East joined Team Kalt members Ken Marshall, Gary Kurtzman, Marty Kuhns and Brian Suarez and answered questions about Kalt heli-

*(Continued on page 108)*

## BAKERSFIELD

*(Continued from page 104)*

copters and JR Remote Control radios. Steve Helm and Robert Gorham from Futaba were available all weekend to answer questions about the Futaba product line.

At the Miniature Aircraft booth, Wayne Mann was available to answer X-cell-related questions.

### CONCLUSION

The crashes this year were significantly fewer than the 32 crashes that occurred last year. What was lacking in quantity was made up by quality crashes. There were three midairs—one in the pylon racing and two in open flying. In one of the open-flying midairs, both helicopters landed, and the only damage was a bent flybar. Next year, the KRBR is considering having contest events on all three days. They're planning to expand the pylon racing to a two-day event, with the first day for qualifying only. If you would like to attend one of the largest helicopter fun flys in 1995, mark May 5, 6 and 7 on your calendar. Contact club president Dave Dahl at (805) 392-8837.

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## PADRE'S PARACHUTE

*(Continued from page 44)*

out of control, I simply activate the "release switch" on the radio, and the streamer or glider is released.

The original engine in the Falcon was a Veco .19. I soon changed it to an Enya .35. Eventually, I put an ST .60 in it, and I actually wore the engine out with so many flights. It now has an ST .61 in it.

On one occasion in Eugene, OR, I had two chutes instead of one on the bird, and I was going to release the chutes just below the low clouds. The next thing I knew, the plane had disappeared from view. I could hear it, but I couldn't see it, so I continued climbing by sound. When the sound was directly overhead, I released the chute and waited. There it was, coming down through the clouds with both chutes fully opened! It was a beautiful sight.

Believe it or not, on one flight with good thermal activity prevailing, the bird was descending by parachute, but then it maintained its altitude and actually started to go up! It had caught a real "boomer." It was one of the longest descents ever. I usually release the chute at about 1,000 feet, depending on the wind, etc.

## PADRE'S PARACHUTE

*(Continued from page 108)*

Eventually, after about 20 years of flying, I retired the Falcon 56 and, in its place, I built the Sr. Falcon that's shown in some of the pictures. I installed a hot ST .61 in it and, like the original, the new Padre's Parachute Falcon continues to fly and perform perfectly. I've never built a model that has given me so much pleasure and consistent flying. It's always the center of attention and performs to expectations.

I'd be glad to share the details of this effort with anyone who would like more information. Please contact me at 1817 F. St., Eureka, CA 95501; (707) 445-9034. ■

## AIRWAVES

*(Continued from page 9)*

### MULTI-ENGINE ANXIETY

Over the years, I've read most of the model airplane magazines; *Model Airplane News* is the most informative of them all. Please keep up the good work. I'm one of the lucky guys who have very supportive and understanding wives, and this brings me to my reason for writing: my wife has always wanted me to build a large airplane, and I've always loved B-17s. My problem is the ever-so-popular flameouts; I've heard many horror stories of airplanes that went down owing to engine failure. Although I'd like to build a B-17, I'm not sure that I'm ready to handle a four-engine airplane. I've heard that there are devices on the market that help to solve this problem; could you point me in the right direction? Also, who sells plans or a full kit for the B-17 in a 6- to 10-foot wingspan? Thanks for your time.

ROCKY SHARP
*Spokane, WA*

*Rocky, the best way to approach a multi-engine project is to think of the model as more than one airplane. That is to say, start, adjust and tune each engine individually; don't try to "sync" all the engines together. As you adjust each engine by itself and get a good idle and throttle transition, leave it alone and go on to the next. When all the engines are running, avoid the temptation to tweak them further; this only leads to one or more becoming too lean during the flight; an engine-out situation is sure to follow. Dan Parsons wrote an excellent article on multi-engine models in our special issue, "R/C Sport Flying" (January '94). Dan details many techniques for successfully building, setting up and flying multis and gives advice on*

*(Continued on page 125)*

## AIRWAVES

*(Continued from page 109)*

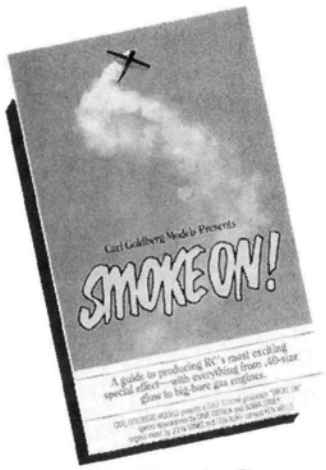
*what to do if something goes wrong. He says, "If you lose an engine, don't kick in any rudder; just continue to fly the airplane and try to land as soon as possible." Dan has been involved with models since 1952. You can order a copy of R/C Sport Flying from our mail-order department, (800) 243-6685, for $4.95 plus $3 S&H.*

*Kits for the Boeing B-17 Flying Fortress are available from Wescraft, 43176 Business Park Dr., #104, Temecula, CA 92590; (909) 695-0735. Frank Johnson, owner of Wescraft, offers a 1/10-scale fiberglass and foam B-17G kit. The 10-foot-span model has a fiberglass fuselage and foam-core wings and tail. The kit includes clear plastic turrets and fiberglass engine cowls and nacelles. If you want a really big bomber, Frank will be producing a 1/5-scale B-17 with a wingspan of 20 feet, 9 inches. This monster will debut at the Bomber Field Big Bird Fly-In in Houston, TX, in September. This one should really keep you busy.*

*Another B-17 kit is available from Royal Products, 790 W. Tennessee Ave., Denver, CO 80223; (303) 778-7711. The Royal B-17 is smaller with a 77 3/4-inch wingspan, and construction is balsa and plywood with many plastic formed parts. It's powered by four .20 to .25 engines.*

*Bob Holman Plans—P.O. Box 741, San Bernardino, CA 92402; (909) 885-3959—offers a set of plans for a 1/10-scale B-17 for $46 plus $2.90 S&H. It has a 124-inch wingspan and uses four .40 or larger 2-stroke glow engines for power. Epoxy/glass engine cowls, a plastic nose cone and gun turrets are also available for $75 plus $5 S&H. Good luck on your next bombing mission.* GY


by JEF RASKIN




## SMOKE ON!

***Subject:*** *how to make effective smoke trails with internal-combustion-powered model planes.*
***Source:*** *Carl Goldberg Models Inc., or Gulf Stream Air Video; (800) 531-1784.*
***Summary:*** *an authoritative, informative, well-done tutorial that's fun to watch.*
***List price:*** *$29.95*
***Rating:*** ✈ ✈ ✈ ✈ ✈
***Approximate length:*** *55 minutes*

A tiny model in the vast sky is not the most visually arresting thing in the world, but the addition of smoke can make that model and its path the most prominent sight around. Many people find that a smoke trail adds excitement to an aerobatic performance but, until recently, only a dedicated experimenter could set up a smoke system for a model plane. Now a number of brands of smoke generators allow any internal combustion engine (.40 and up) to generate dense, lasting smoke trails.

There are two basic methods to make smoke: using engine or muffler pressure and using an electric pump. This video demonstrates the B&B diaphragm pump, the Slimline and TME electric-pump systems and two engine-pressure systems. All the smoke systems shown work very well, but to my eye, the electric-pump models (of whichever brand) seemed to have the edge. The information is well-presented and useful; after watching this tape, you should be able to go out and set up a smoker for your own plane. Cutaway models show the hookups in detail.

The tape is detailed and specific: for example, we learn that smoke fluids can attack some kinds of covering, that you need to use black neoprene tubing and that an ordinary wheel collar placed around the tubing is great for setting flow rates. There's a lot of good flying (photographed in Georgia and Arizona) to demonstrate the various systems and keep you entertained between the technical bits.

Small quibble: we see a pilot set a bad example by reaching over a spinning prop to adjust an engine. Also, should one avoid getting smoke in one's face?

As well as being a fine tutorial, this video was made with a light touch. I've always trusted Carl Goldberg models and parts; their videos show the same care and quality. One last thought: with all this great smoke, is model skywriting next?

## NOVA: DAREDEVILS OF THE SKY

***Subject:*** *the American aerobatic team goes to the 1992 World Aerobatics Championships.*
***Source:*** *WGBH; (800) 255-9424.*
***Summary:*** *a fascinating view of what goes into full-scale aerobatics; some inaccuracies.*
***List price:*** *$19.95*
***Rating:*** ✈ ✈ ✈ ✈ ✈
***Approximate length:*** *54 minutes*

The 1992 World Aerobatics Championships is highlighted in this video, which introduces a new world-class aerobatic plane—the clean-lined Staudacher S341—that will probably be modeled along with Pitts, Extras and Sukhois.

The show opens with the S341 doing a "forever" vertical torque roll, followed by an incredibly long, slow tailslide and a knife-edge spin. We see black-and-white footage of some of the weird flying-machine failures from the first decades of the century. We meet some of America's best fliers, such as Cecilia Aragon and Patty Wagstaff. Since neither sex has any inherent advantage when it comes to piloting, the U.S. no longer holds separate events for women and men, and Ms. Wagstaff was the U.S. champion going into the world championships. A plus is the triple-screen technique for showing the basic maneuvers. We see, simultaneously, the pilot's view, the plane making the maneuver and an animated detail of the attitude of the plane at each moment—nice.

Watching an aerobatic routine is like listening to a poem or a piece of music; one maneuver flows into the next, and the entire sequence (which takes only a few minutes) is a carefully planned work of art. Yet the producers continually break up not only routines, but also individual maneuvers, so that little sense of continuity is left. We don't get to see even one sequence in its entirety. The tape repeatedly cuts to a crowd scene, the judges watching the maneuver, or a view of the pilot's face, distorted by high acceleration.

One expects PBS, especially the Nova series, to be historically and technically accurate. The show could have scored higher marks in this regard. I will give one example to represent the many: we are told that rudders turn an airplane (and that the Wright brothers discovered this). The Wright brothers added rudder control to counteract the adverse yaw from their wing-warp ailerons; they understood fully that the ailerons and the elevator—not the rudder—turn an airplane.

I don't like the title much: in reality, aerobatic pilots are far from "daredevils"; yet I am glad that Nova covered the aerobatic event and put it into historical context. The photography and production are first rate, and the price is right. If you're interested in aerobatics, this tape is definitely for you. ■

# INDEX OF MANUFACTURERS

**3W;** distributed by Desert Aircraft (see address below).

**Ace R/C Inc.,** P.O. Box 472, Higginsville, MO 64037-0472.

**AERO*COMP,** P.O. Box 753, Hackettstown, NJ 07840-0753; (908) 850-4131.

**Aero-naut Modellbau,** Stuttgarter Strasse 18, Postfach 72701, 72766 Reutlingen 1, Germany.

**Aerrow Inc.,** P.O. Box 183, Perth, Ontario, Canada K7H 3E3.

**Airtronics Inc.,** 11 Autry, Irvine, CA 92718; (704) 830-8769.

**The Aeroplane Works,** 2134 Gilbride Rd., Martinsville, NJ 08836.

**All American Kit Cutters,** 365 Dutch Neck Rd., Hightstown, NJ 08520; (609) 443-3175.

**American Eagle,** 4608 Chastant St., Mutaire, LA 70006; (509) 885-8263.

**APC Props;** distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645.

**Astro Flight Inc.,** 13311 Beach Ave., Marina Del Rey, CA 90292.

**B&B Specialties,** 14234 Cleveland Rd., Granger, IN 46530.

**Barton Machining,** 11640 Salinez, Garden Grove, CA 92643.

**Bergen Machine & Tool Co.,** 17013 Lakeview Dr., Vandalia, MI 49095; (616) 476-9364.

**Bob Smith Industries,** 8060 Morro Rd., Atascadero, CA 93422.

**Bob Violett Models,** 170 State Rd. 419, Winter Springs, FL 32708; (800) 899-1144.

**Bridi [Dave] Horn Dog Racing,** P.O. Box X, Torrance, CA 90507; (310) 212-3257.

**CB Associates Products;** distributed by CB/Tatone Inc., 21658 Cloud Way, Hayward, CA 94545; (510) 783-4868.

**Century Imports & Exports,** 521 Sinclair Frontage Rd., Milpitas, CA 95305-5413; (408) 942-9525.

**Century Jet Models,** 8305 Regency Woods Way, Louisville, KY 40220; (502) 491-4114.

**Cirrus Ventures,** 115 Hunter Ave., Fanwood, NJ 07023; (908) 322-7221.

**Concept;** manufactured by Kyosho; see address under Kyosho/Great Planes Model Distributors.

**Coverite,** 420 Babylon Rd., Horsham, PA 19044.

**Custom Electronics,** R.R. 1, Box 123B, Higginsville, MO 64037; (816) 584-6284; fax (816 ) 584-6285.

**D&W Aircraft,** 409 Mid Pines Way, Modesto, CA 95354.

**Dave's Custom Models,** 27B Spring Cir. Dr., Austin, TX 78736; (512) 288-2055.

**Davis Diesel Development,** P.O. Box 141, Milford, CT 06460; (203) 877-1670.

**Desert Aircraft,,** P. O. Box 18038, Tucson, AZ 85731; (602) 722-0607.

**Du-Bro Products,** 480 Bonner Rd., Wauconda, IL 60084.

**Dynamax;** distributed by Aeroloft Designs, 2940 W. Gregg Dr., Chandler, AZ 85224.

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**Ernst,** 37396 Rubin Ln., Sandy, OR 97055.

**Fox Mfg. Co.,** 5305 Towson Ave., Ft. Smith, AR 72901.

**Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

**Graupner;** distributed by Hobby Lobby Intl. (see address below).

**GSARA** (Giant Scale Air Racing Assoc.); see address under Bridi [Dave].

**Hi-G Promotions Inc.,** P.O. Box 219181, Houston, TX 77218; (800) 741-7058.

**Hitec RCD,** 10729 Wheatlands Ave., Ste. C, Santee, CA 92071; (619) 258-4940.

**Hobby Lobby Intl.,** 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444.

**Horizon Hobby Distributors,** 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

**Hot Stuff;** distributed by Satellite City, P.O. Box 836, Simi Valley, CA 93062.

**Induction Systems Inc.,** P.O. Box 489, Chouteau, OK 74337.

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**ISC International;** distributed by Indy R/C (see address above).

**J.V. Scale Aircraft,** John Walter, 930 Mulberry Ct., Middletown, DE 19709; (302) 378-6367

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**JB Weld Co.,** P.O. Box 483, Sulphur Springs, TX 75482.

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**Kalt;** distributed by Horizon Hobby Distributors (see address above).

**Kress Jets Inc.,** 4308 Ulster Landing, Saugerties, NY 12477.

**Kyosho/Great Planes Model Distributors,** P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300.

**Lanier RC,** P.O. Box 458, Oakwood Rd., Oakwood, GA 30566.

**Likes Line Retracts,** 1601 Airport Dr., Mechanicsburg, PA 17055; (717) 732-0636.

**Mac Products,** 7935 Carlton Rd., Sacramento, CA 95826.

**Master Airscrew;** distributed by Windsor Propeller Co., 3219 Monier Cir., Rancho Cordova, CA 95742.

**Miller R/C,** P.O. Box 425, Kenwood, CA 95452; (707) 833-9505.

**Miniature Aircraft USA,** 3743 Silver Star Rd., Orlando, FL 32808; (404) 292-4267.

**Model Airplane Products;** distributed by Slegers Industries, Rte. 15, Wharton, NJ 07885; (201) 366-2525.

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**Nick Ziroli Models,** 29 Edgar Dr., Smithtown, NY 11787.

**NorCal Avionics,** 5689 Glasgow, Troy, MI 48098.

**Normark,** 1710 E. 78th St., Minneapolis, MN 55423.

**Nosen Models;** A&A Industries, Cty. Rd., A22, P. O. Box 244, Sibley. IA 51249; (712) 754-3930.

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**Pactra Inc.,** 620 Buckbee St., Rockford, IL 61104.

**Perma-Grit Products,** 1302 Berwin Ave., Dayton, OH 45429.

**Petal Mfg.,** 58 Spencer Rd., Basking Ridge, NJ 07920; (908) 766-7095.

**Pirate Models,** 13907 Hirshfield Rd., Unit L, Tomball, TX 77375; (713) 351-6617.

**Powermaster Products Inc.,** 7807-H Telegraph Rd., Montebello, CA 90640.

**Precision Eagle engines;** manufactured by Planes Plus, 5 South 470-B Scots Dr., Naperville, IL 60563.

**Proctor Enterprises,** 25450 N.E. Eilers Rd., Aurora, OR 97002.

**QDI,** Double Digit Publications, 5 Wootton Rise, Wootton Wawn, Warwickshire, B95, 6BJ, England; (44) (0) 564 792784. In the U.S. Fulco Inc., 30 Broad St., Denville, NJ 07843.

**Quick Cap Battery Connectors,** Wirthco Engineering Inc., 8131 Pennsylvania Cir., Ste. 100, Bloomington, MN 55438; (612) 941-9073.

**Racer's Edge,** 101-A Hickey Blvd., #501 South San Francisco, CA 94080 (415) 756-2214.

**R.S. Hirsh Raceplanes,** 8439 Dale St., Buena Park, CA 90620 (714) 828-7369.

**Real Balls,** Douglass Boyd, 8325 S.W. Mohawk #31, Tualatin, OR 97062; (503) 692-0363.

**Rev-Up;** distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.

**Rich Uravitch,** 15 Newcomb Trail, Ridge, NY 11961; (516) 929-4132.

**Riteco Supply Inc.,** 12999 FM 529, Houston, TX 77041; (713) 896-6200.

**Robart Mfg.,** P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616.

**Saito;** distributed by Horizon Hobby Distributors, (see address above).

**Satellite City,** P.O. Box 836, Simi, CA 93062.

**Sig Mfg. Co.,** 401 S. Front St., Montezuma, IA 50171.

**Sky Aviation,** 1320 Gay Lussac, Ste. 106, Boucherville, P.Q., Canada J4B 7G4.

**Slimline Mfg.,** P.O. Box 3295, Scottsdale, AZ 85257.

**Soaring Research,** 454 Wildrose Ln., Bishop, CA 93514; (619) 873-4932.

**SR Batteries Inc.,** Box 287, Bellport, NY 11713; (516) 286-0079.

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**Tech Specialties,** 218 Vernon Rd., Greenville, PA 16125.

**The Aeroplane Works,** 2134 Gilbride Rd., Martinsville, NJ 08836.

**Thompson's Vintage Race Plane Classics,** 1005 N. 3rd St., Riverton, IL 62561; (217) 629-8225, or 522-6526.

**Thunder Tiger,** 2430 Lacy Ln., #120, Dallas, TX 75006; (214) 243-8238.

**Tim Farrell,** 4930 47th St., Lubbock, TX 79414.

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**Tru-Turn Precision Model Products/Romco Mfg. Inc.,** P.O. Box 836, South Houston, TX 77587; (713) 943-1867.

**Vailly Aviation,** 18 Oakdale Ave., Farmingville, NY 11738; (516) 732-4715.

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**Wescraft,** 43176 Business Park Dr., #104, Temecula, CA 92590; (909) 695-0735.

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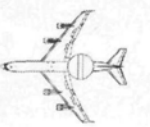
**Zenoah;** distributed by Indy R/C (see address above).

**Zinger;** distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.



MODEL AIRPLANE NEWS

# HOBBY SHOP DIRECTORY

## BRAZIL

■ **BELO HORIZONTE**
Completa linha de aeromodelos, carros, barcose helicopteros radio controlados, plastimodelismo, componentes e servicos. Importacao direta.
**HOBBY N' WOOD MODELISMO**
**AV. SILVIANO BRANDAO 2100**
**031-463-9944**

## CONNECTICUT

■ **GLASTONBURY**
Full-line hobby store since 1978.
Worth a trip from anywhere!
Open daily at 10; closed Sunday.
In the Fox Run Mall
**DAVIS HOBBIES**
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■ **ORLANDO**
A complete hobby shop that has everything you need for R/C airplanes, helicopters, boats and cars. Open Mon. – Sat., 10 – 6 and Fri. until 8.
**BOB'S HOBBY CENTER, INC.**
**7333 LAKE UNDERHILL RD.**
**(407) 277-1248**

■ **WINTER SPRINGS**
UPS orders shipped daily. Dealer for Yellow Aircraft. Send $3 for Yellow info. pack. Full line of hobby accessories. Visit our showroom 35 minutes from Disneyworld.
**BOB FIORENZE HOBBY CENTER**
**420 W. S.R. 434 (407) 327-6353**

## GEORGIA

■ **ACWORTH**
We're 100% airplanes!—everything from free-flight rubber-powered to the largest R/C aircraft. Ask for our mail-order catalogue–$3. Open Mon. – Sat., 10 – 7.
**HOBBY SUPPLY SOUTH**
**5060 GLADE RD.**
**(404) 974-0843; fax (404) 974-6243**

■ **MARIETTA**
The most complete hobby shop in Atlanta. R/C airplanes, cars, boats and helicopters. HO, 027 and O-scale trains. Plastic models. Open Mon. – Fri., 10:30 – 7:30; Sat., 10 – 6; Sun., 1 – 5.
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**1467 ROSWELL RD. (404) 971-2227**

## MARYLAND

■ **ROCKVILLE**
Maryland's largest hobby selection: R/C airplanes, helis, cars, boats. Mail-order pricing. Parts, parts, parts, parts, parts, parts!
**GPA HOBBIES**
**1300 E. GUDE DR. (301) 738-0014**

## NORTH CAROLINA

■ **KING**
The largest selection of kits and parts for helicopters, cars and planes. Open Mon.– Fri., 10 – 8; Sat., 10 – 7. EXCELLENT SERVICE!
**KING R/C HOBBY SHOP**
**FIVE FORKS VILLAGE (910) 983-3969**

## NEW HAMPSHIRE

■ **NASHUA**
We have the largest inventory of R/C airplanes, helicopters and accessories in the N.E. We also carry Estes rockets, books and videos, slot-car racing. NO SALES TAX; MAIL ORDER.
**R C BUYERS WAREHOUSE**
**95 NORTHEASTERN BLVD.**
**(603) 595-2494**

## NEW JERSEY

■ **JACKSON**
Full-line, full-service hobby shop. Planes, boats, cars, helicopters, R/C equipment. Extensive inventory; knowledgeable personnel. Established in 1969.
**JACKSON HOBBY SHOP**
**2275 RTE. 526 (908) 364-3334**

■ **RIVER EDGE**
Everything for R/C, U/C and F-F modeling. R/C cars, boats, planes, helis, tanks; rocketry. Modeling tools and equipment at discount prices. Huge inventory. Visa, M/C, Discover.
**AMERICA'S HOBBY CENTER**
**820 KINDERKAMACK RD.**
**(201) 265-2044**

## NEW YORK

■ **NEW YORK**
Everything for R/C, U/C and F-F modeling. R/C cars, boats, planes, helis, tanks; rocketry. Modeling tools and equipment at discount prices. Huge inventory. Visa, M/C, Discover.
**AMERICA'S HOBBY CENTER**
**146 W. 22ND ST. (212) 675-8922**

■ **SELDEN**
We specialize in R/C models of all types! Open 7 days: Mon., Tue., Thu., Fri. 10 – 9; Sat., 10 – 6; Sun., 11– 5.
**ACTION HOBBIES**
**1070 MIDDLE COUNTRY RD.**
**(516) 736-1574**

■ **WESTMORELAND**
From 1/4 scale to trainers—everything you need to build and fly your R/C airplane. Come see for yourself! Open Mon. – Fri., 12 – 9; Sat., 9 – 5; closed Sun.
**BRENNAN'S R/C AIRCRAFT/SUPPLY**
**6368 STATE RTE. 5 (315) 829-4930**

## OHIO

■ **FINDLAY**
Findlay's R/C dealer—planes, cars, boats and trains. Many kits, accessories and parts. Sig and Dremel dealer. Model rockets. Open Tue/Thu., 1 – 9; Mon/Wed/Fri., 10 – 9; Sat., 10 – 5.
**JINX MODELS SUPPLIES**
**721 ROCKWELL AVE. (419) 422-5589**

■ **WESTERVILLE**
Huge selection of R/C planes, boats and cars. Distributor of Direct Connection R/C kits. Open Mon. – Fri., 10 – 8; Sat., 10 – 6; Sun., 12 – 5.
**CAPSTONE HOBBIES**
**562 W. SCHROCK RD. (614) 899-6313**

## PENNSYLVANIA

■ **LANSDALE**
"An old-time hobby shop" Rubber power, free flight, control line, electric, R/C airplanes, cars and boats. Mon.-Thu., 3 – 9; Fri., 12 – 9; Sat., 10 – 5; Closed Sun.
**PENN VALLEY HOBBY CENTER**
**837 W. MAIN ST. (215) 855-1268**

■ **STATE COLLEGE**
We carry major brands of R/C airplane kits, radios, engines, balsa, spruce, parts, accessories, parts, propellers. We want to serve you!
**NITTANY LINE HOBBIES**
**127 SOUTH FRASER ST.**
**(814) 237-7100**

## TEXAS

■ **ROCKWALL**
"The Computer-Aided Hobby Shop." Full-service R/C hobby shop. R/C cars, boats, airplanes and helicopters. Nationwide computer BBS: (214) 853-4001.
**TELEHOBBIES R/C**
**839 HWY. 276 (214) 771-6204**

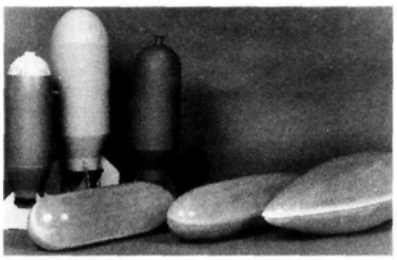
## VERMONT

■ **BROWNSVILLE**
Airplanes and helicopters. Help for beginners.Ten years in business; 33 years R/C experience. Easy access—6 miles from Interstate Rte. 91. Open Mon. – Fri., 1 – 8; Sat., 12 – 6.
**THE R/C STORE**
**P.O. BOX 10, RICH RD.**
**(802) 484-3711**

## VIRGINIA

■ **TAZEWELL**
R/C airplanes, helicopters, cars and boats. Complete line of hardware in stock—always! Everything from wind up to ultralight airplanes. Open 8 – 6 p.m., Mon. – Sat.
**APEX HOBBIES**
**RTE. 3, BOX 773B (703) 988-9005**

# PRODUCT NEWS

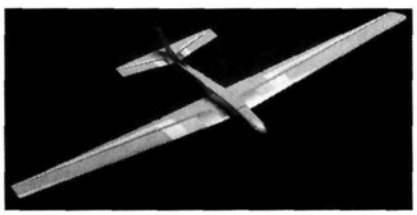


### FRANK TIANO ENTERPRISES
## Fiberglass Bombs, Tanks and Pants

Frank Tiano Enterprises (FTE) offers the scale modeler an extensive line of fiberglass bombs and wing or belly drop tanks. The bombs and tanks can be used for static display or for actual dropping. For the "civilian"-aircraft modeler, FTE offers its new line of epoxy-glass wheel pants, and they come with a full money-back guarantee if you're not satisfied.

Bombs are available in 500- and 1,000-pound sizes in ⅛, 1/6 and 1/5 scale for $13 to $24 each. A 1/6-scale P-47 belly tank costs $36, and a wing tank, $32. Japanese wing tanks in 1/5.5 scale are $30 each. The modeler must fashion his own release mechanism. Wheel pants come in four styles, and they fit 2¾-inch to 4½-inch wheels. No hardware is included. Prices range from $29 to $31 per pair.

**Frank Tiano Enterprises**, 15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600; fax (407) 795-6677.



### K&A Models Unlimited
## Silverstreak

This new 50-inch slope glider is one of the best in its class. It's very fast and capable of performing full aerobatic maneuvers. The Silverstreak is also available with a fiberglass fuselage. Specifications: wingspan—50 inches; wing area—287 square inches; weight—19 to 20 oz. For more information, send an SASE to:

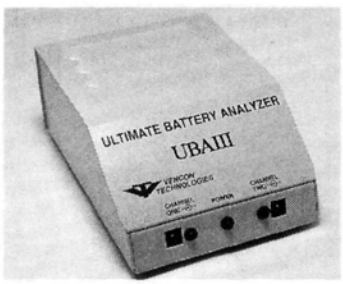
**K&A Models Unlimited**, 6059 Faculty Ave., Lakewood, CA 90712; (310) 804-0006.

### SIG MFG. CO.
## Tri-Star

Sig's new Tri-Star can be built as a glow- or electric-powered sport flier, or as a slope-soaring acrobat. With foam wing-cores and high-quality, laser-cut balsa-and-ply construction, this model can be built quickly. The 35-inch-long Tri-Star has a wingspan of 47½ inches. Power requirements: glow power—.09 to .15 2-stroke engine; electric power—05-size motor (direct drive) with seven to nine cells (1000 to 1700mAh). You'll need a 2- or 3-channel radio system (no mixing required).

**Price**—$69.95 (kit only).

**Sig Mfg. Co. Inc.,** 401 S. Front St., Montezuma, IA 50171; (515) 623-5154; fax (515) 623-3922; toll-free orders (800) 247-5008; modelers' hot line (800) 524-7805.

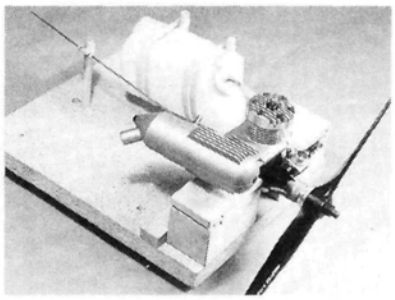



### Vencon Technologies Inc.
## Ultimate Battery Analyzer III

With your PC, the new Ultimate Battery Analyzer III, will test any Ni-Cd or NiMH (nickel hydride) battery pack of one to 10 cells, with capacities of up to 10Ah and 6V and 12V gel-cells and wet cells of up to 40Ah. It identifies batteries that are deteriorating and about to fail and cycles your batteries to eliminate memory and restore the cells' capacity. The analyzer includes a built-in field charger and trickle-charger and comes with a 30-day money-back guarantee and a full two-year warranty.

**Price**—$199.95, special introductory price—$159.95 (plus $10 S&H).

**Vencon Technologies Inc.**, 5 Graymar Ave., Downsview, Ontario, M3H 3B5, Canada: (416) 398-0261; fax (416) 398-0625.

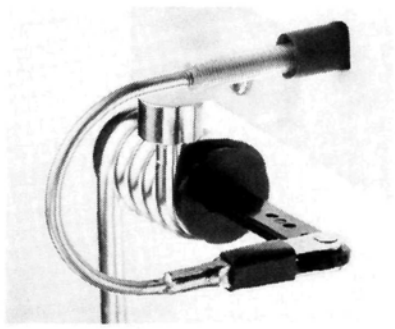


### AMERICAN HOBBY PRODUCTS
## Engine Test Stand

American Hobby Products' "Better" Engine Test Stand features fully accessible, beneath-the-mount locking hardware that doesn't interfere with the engine's muffler; massive, 1½-inch-wide maple mounts that engage the full width of all the engine-mounting lugs; and steel pins on mounting blocks that engage the forward engine-lug holes to prevent the engine from slipping out. The stand accommodates modern engines with displacements of .10 to 1.20ci. A vibration-isolated fuel-tank mount and a throttle-rod support element are included.

**Price**—$21.95.

**American Hobby Products**, 12 West Hill Cir., Reading, MA 01867; (617) 944-8316.



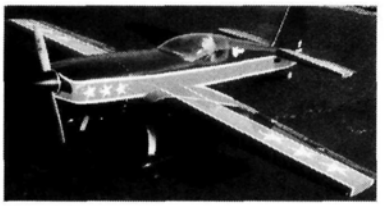
### DU-BRO PRODUCTS INC.
## E/Z Mount Steering Arm

Du-Bro introduces a new steering arm that's mounted right in the spring coil of the nose gear. This new design eliminates the need to file flat spots on the steering arm, and it stops the twisting of the steering arm during hard landings. The new steering arm also solves space problems on installation. The E/Z mount steering arm is installed on the nose gear with just one screw and features a rubber, shock-absorbing design.

**Part no.**—664; **price**—$1.95.

**Du-Bro Products Inc.,** P.O. Box 815, 480 Bonner Rd., Wauconda, IL 60084; (708) 526-2136.

# PRODUCT NEWS

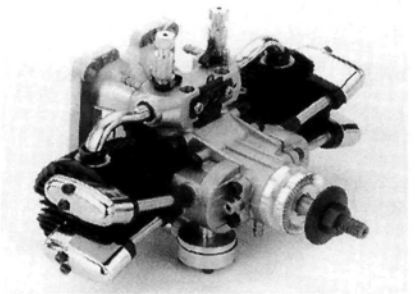


### OHIO R/C MODELS
## Extra 300S

Available in kit form or built up, the Extra 300S features a fiberglass cowl and wheel pants, T-6 aluminum landing gear and a crystal-clear canopy. The built-up kit has fully framed and sheeted wing panels with ailerons cut out; a jig-built fuselage and optional motor mount; and framed and sheeted tail surfaces. Recommended engines include the Quadra 42 or 45; Sachs 2.6, 3.2 and 3.7; Tartan Twins; SuperTigre 4500; O.S. BGX; and Zenoah G45 and G62. Specifications: length—72 inches; wingspan—84 inches; wing area—1,260 square inches.

**Kit no.**—122; **prices**—$369 (kit), $750 (built up).

**Ohio R/C Models**, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660; fax (513) 859-7202.



### SAITO
## 100 Twin 4-Stroke Engine

The new Saito 100 Twin 4-stroke engine is lighter, stronger and smoother than the 90 Twin it replaces. The 100T uses all new, high-silicone-content, aluminum pistons and rods. A special diaphragm pump creates positive crankcase pressure for proper lubrication. The 100T has a true, chrome-plated, one-piece cylinder that won't leak or become distorted. The 100T also features twin carburetors, hemispherical cylinder heads, uncompromising counterbalancing and a scale-like sound that only a 4-stroke can produce.

**Part no.**—SAIE100T; **price**—$739.95.

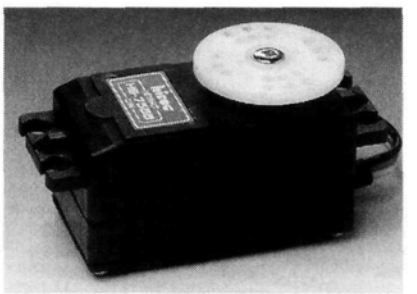
**Saito;** distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.


### WINDWARD PRODUCTS
## Portable Hobby Meter

Windward Products introduces the WP2000—a lightweight, compact meter with an expanded scale voltmeter function. The meter places a 37-ohm load on the battery being tested, and the display shows the current being provided by the battery. The WP2000 can also test diodes and measure AC and DC voltage, resistance and DC current up to 200mA.

**Part no.**—WP2000; **price**—$29.95.

**Windward Products;** distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511 or (800) 535-5551; and by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300 or (800) 682-8948.



### HITEC RCD INC.
## HS-75BB Retract Servo

The HS-75BB has a ball bearing on top and an Oilite bushing on the bottom, and it uses an indirect-drive system. It's watertight and has one metal gear for added strength. At 4.8 volts, the speed for 60 degrees is 0.5 second, and it generates 92 oz.-in. of torque. The 1.23-ounce HS-75BB is slightly under 1 inch tall, so it can easily be mounted on the wing.

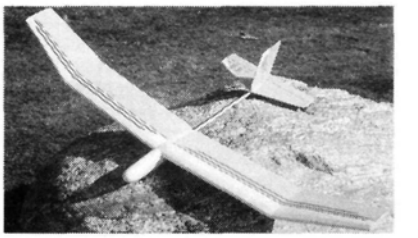
**Part no.**—HSE075; **price**—$64.95.

**Hitec RCD Inc.**, 10729 Wheatlands Ave., Ste. C, Santee, CA 92071; (619) 258-4940; fax (619) 449-1002.


### Badger Air-Brush Co.
## Basic Spray-Gun Set

Model 250, the mainstay of Badger's extensive air-brush line, has recently received a face-lift. This basic spray-gun set is now made of sleek-looking, jet-black Delrin™. The kit's 50-200 Propel regulator and 50-001 vinyl hose is also finished in black.

**Badger Air-Brush Co.**, 9128 W. Belmont Ave., Franklin Park, IL 60131; (708) 678-3104; fax (708) 671-4352.



### MM Glider Tech
## The Merlin

The Merlin is made of a durable ABS polystyrene, vacuum-formed pod. It has a built-up wing and a solid tail for quick, simple construction. Its boom is made of a fiberglass aeroshaft that provides strength and durability. A micro or mini radio system is required. Specifications: wingspan—50 inches; wing area—280 square inches; wing chord—6 inches; fuselage length—26¼ inches; flying weight—12 to 20 ounces.

**Price**—$36.95 (plus $5 S&H; CA residents, add 8.25-percent sales tax).

**MM Glider Tech**, P.O. Box 39098, Downey, CA 90239; (310) 923-2414.

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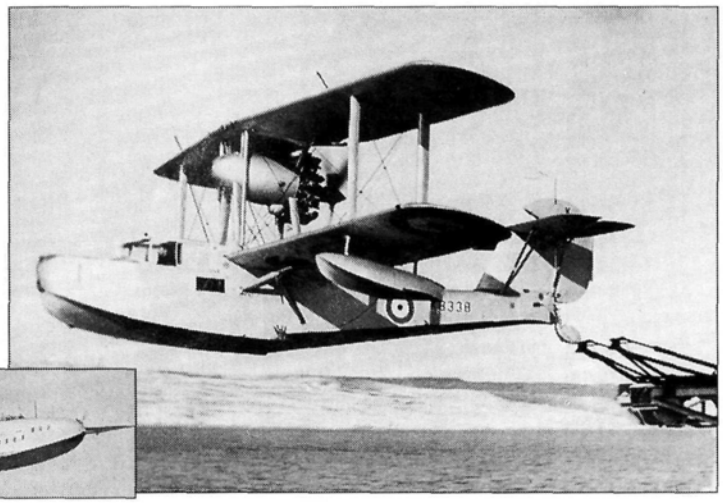
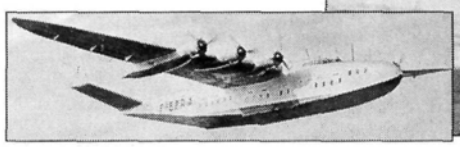
Descriptions of products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Julie Soriano.

# NAME THAT PLANE

## CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.





CONGRATULATIONS to Robert Wynne of Mercer Island, WA, for correctly identifying the June '94 mystery plane. The French Latécoère 631 was a six-engine, long-range commercial flying boat that was designed to cross the Atlantic. The all-metal craft was 140 feet, 10 inches long and had a central hull and retractable stabilizing floats. Each of the six Gnome-Rhone P.18 air-cooled radial engines was rated at 1,500hp, with 1,650hp available for takeoff. The 58,740-pound Latécoère had a wingspan of 186 feet, 11 inches and had a maximum permissible overload weight of 145,200 pounds. It could reach 261mph, and its cruising speed at 70 percent power was 217.3mph. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

# CLUB OF THE MONTH

**F-TROOP**

**12740 E. Andy St., Cerritos, CA 90701**

Congratulations to the members of the F-Troop club for being this month's winner! Their well-organized newsletter, *The F-Word*, exudes a genuine warmth; it gives you a feeling that the club members share a sense of camaraderie. The July '94 newsletter highlights the results of Top Gun '94, which was held in West Palm Beach, FL. The photos, courtesy of F-Trooper Frankie Tiano, were beautifully reproduced in color.

Aside from the lovable Frankie, this club's roster includes Dean DiGiorgio, Claude McCullough, Pat McCurry, Brian O'Meara, Dennis Crooks, George Leu and others. If these names sound familiar, it's because these F-Troopers were some of the pilots who competed at Top Gun (except for George, who served as chief flight judge).

This newsletter consists of columns, such as "The Peter's Dribble," and "Excess Dribblings." Editor Pete Sepulveda gives us highlights of the various things that are going on. There's an advice column called "Dear Ferd," beautiful three-view drawings of the Beechcraft G17S and a calendar of events that lists not only fly-ins and club members' birthdays, but also important dates in history. There's also a great article called "Painting Fiberglass Fuselages" by David Godfrey of Huntsville, AL, and one called "Crashless Flying" by Lewis Jordan of Houston, TX.

The club is busy preparing for the Fun-Scale Shootout, which will be held in Arizona sometime in November. The F-Troop of Southern California will be competing against the ⅛th Air Force Club of Arizona. Midwest, Pacer Technology and FTE provided glue and 20 Midwest fun-scale kits for both clubs. Look for the results in a future "Sporty Scale" column by Frankie.

F-Troop members take pride in being known for promoting, hosting and participating in scale modeling events. Their motto is "F-Troop puts the 'F' back in model aviation; the 'F' equals fun!"

For their informative and lively newsletter, we award the F-Troop two complimentary subscriptions to *Model Airplane News*. ■

# CLASSIFIEDS

**RATES:** non-commercial—25 cents per word. No charge for name and address (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.**

To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.**

**R/C WORLD ORLANDO, FL, CONDO RENTAL:** 2 bedroom, furnished. Available weekly or monthly. Low rates. 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For information, please call or write to R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

**SALE**—kits: wood, plastic; ignition engines; parts and mags (pre-1965). Specify needs. Send SASE and 60 cents for list. Leonard Roberts, 3819 Lydon Ln., Moosic, PA 18507; (717) 961-2357. [12/94]

**WANTED**: built or partially built Ercoupes, Cessna 150, 152, 172, 182, Grumman American Tiger (AA5), American Yankee (AA1), or Mooney M-10 Cadet. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [11/94]

**PLANS ENLARGED.** Scanning/plotting services; model designer's computer software; free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

**MAKE REAL DECALS** with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764. [11/94]

**GIANT-SCALE PLANS** by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [11/94]

**ENGINES: IGNITION, GLOW, DIESEL**—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [11/94]

**ARE YOU TIRED OF PAYING** $1.29 for six screws? For a *free* catalogue and price list of screws, nuts, locknuts, blind nuts and more, in sizes from 0-80 to 1/4 inch, contact Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (800) 892-6917; fax (908) 788-2607. [11/94]

**MODEL MOTORS WANTED**—Most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [3/95]

**ANTIQUE IGNITION** engine parts: excellent reproductions, fuel tanks, points, timers, coils, needle valves, gaskets, etc. Champion spark plugs. Catalogue—$5 (intl. airmail—$7). Aero-Electric, 1301 W. Lafayette St., Sturgis, MI 49091. [2/95]

**WANTED:** ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc.; Woody Bartelt, 1301 W. Lafayette St., Sturgis, MI 49091; (616) 665-9693, or (800) 982-5464. [2/95]

**SCALE DOCUMENTATION** and resource guide. Larger, updated 1994 Edition. World's largest commercial aircraft collection. Over 5,000 different color FOTO-PAAKS and 25,000 three-view drawings; 152-page resource guide/catalogue—$6 (Canada—$7; foreign—$12). Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [2/95]

**SMOOSHIE BAILS OUT!** Release a scale-like parachutist!—a real crowd pleaser and a lot of fun! For a brochure, send SASE to Hobby Hut Mfg., 2040 W. 21st. N., Ste. 77, Wichita, KS 67203-2107 (Dept MAN). [10/94]

**GERMAN AIRCRAFT WW II**—handbooks, service part lists, instruction manuals. List—$2. Udo E Hafner, Eugen-Bolz-Str. 15, D-71636 Ludwigsburg, Germany. [11/94]

**WW I PLANS**—Peanut to 100 inches. Send $2 for illustrated catalogue to Clark Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [3/95]

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